THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXI. No. 1548.] [LONDON, JANUARY 10, 1893. [45TH YEAR. PRICE 6d.

GAS AND WATER PIPES

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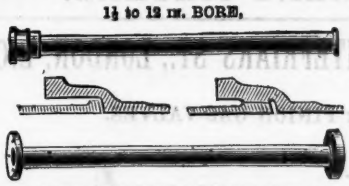

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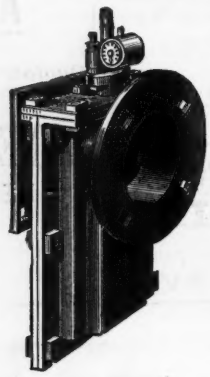

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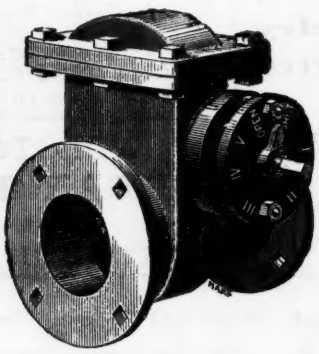

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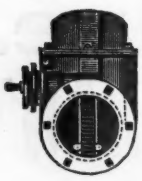

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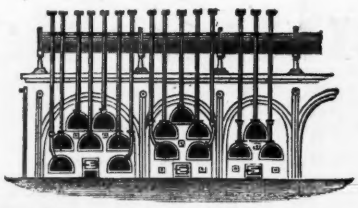

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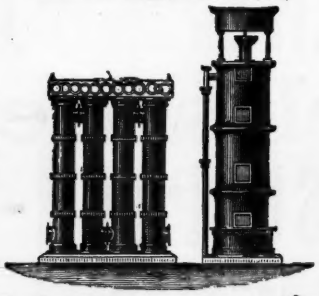

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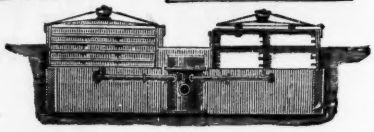

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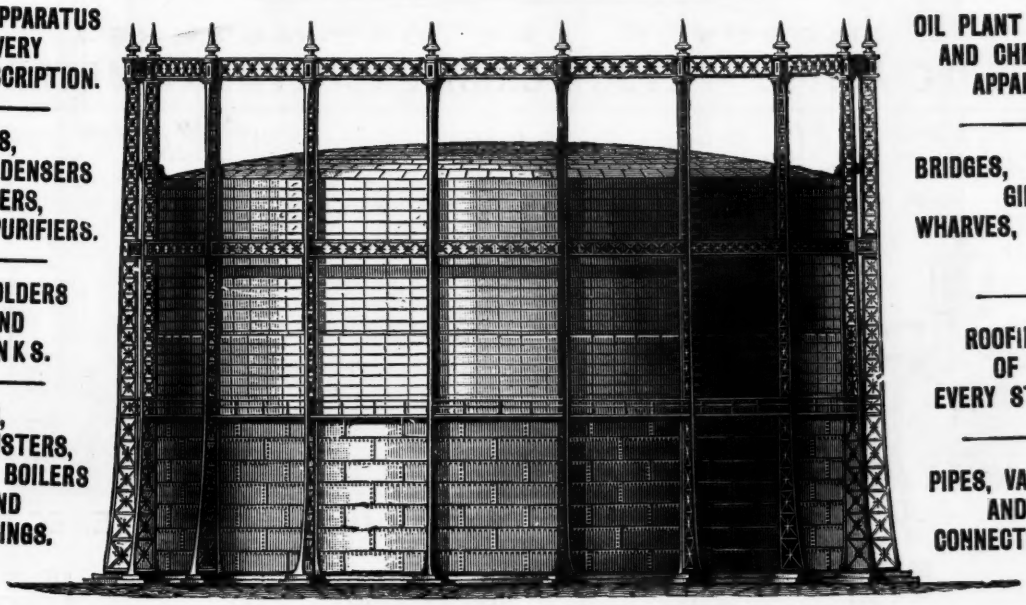

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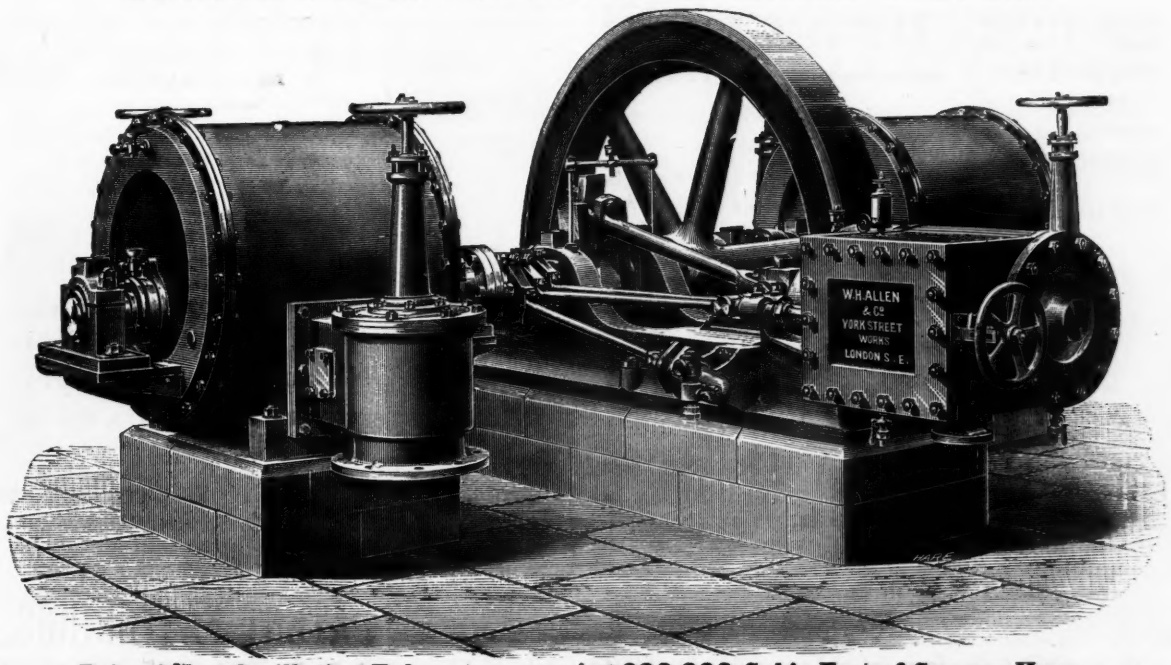

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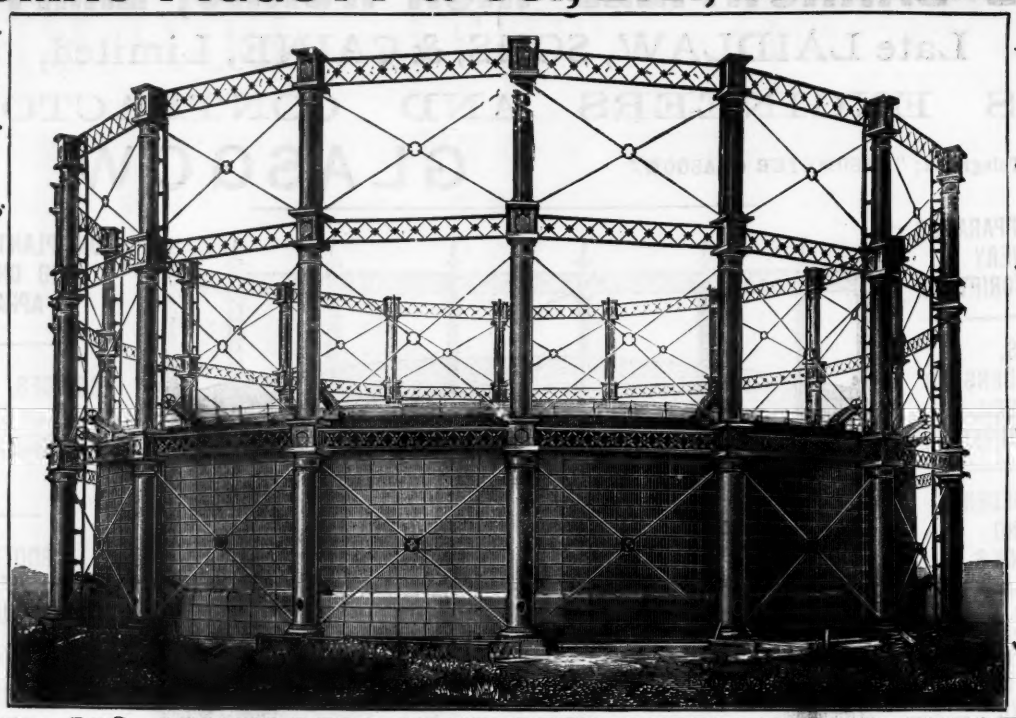

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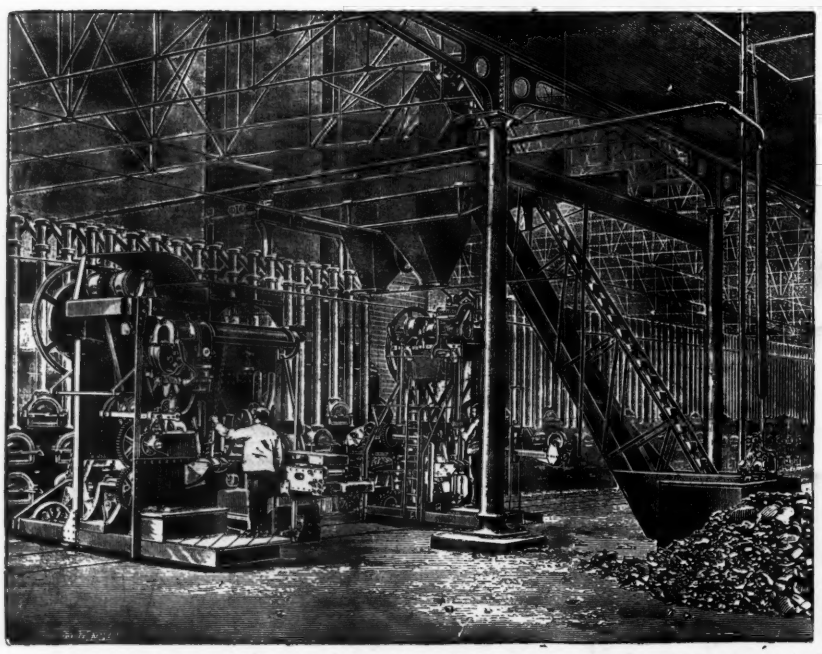

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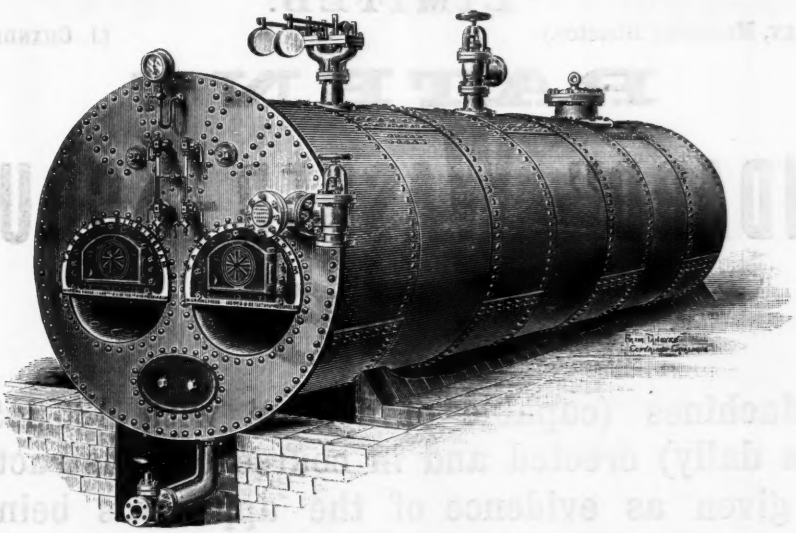

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Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.

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"STANDARD" WASHER-SCRUBBER.

456

of these Machines (capable of dealing with 436,345,000 cubic feet of Gas daily) erected and in course of construction. These facts are given as evidence of the apparatus being the most efficient of any in the market for the extraction of

AMMONIA, CARBONIC ACID, AND SULPHURETTED HYDROGEN FROM COAL GAS.

70 of the above Machines have been constructed according to the Company's latest Patent, which has also been applied to 41 original pattern Machines.

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Messrs. KIRKHAM, HULETT, AND CHANDLER, LTD.,

Gentlemen,

In reply to your inquiry respecting the result ot putting Wooden "Bundles" into some of the Washer-Scrubbers at our Beckton Station, I beg to say they have answered admirably for the few months they have been in; and I think them a decided success.

I am, yours truly,
(Signed) G. C. TREWBY.

NOTE.—Orders since received for four 3,500,000 cubic feet per day Machines for Beckton; and two 3,000,000 cubic feet for Kensal Green, &c., &c.

Extract from the JOURNAL OF GAS LIGHTING, &c., for Sept. 27, 1892, referring to the visit of the Members of the Eastern Counties Gas Managers' Association to the Lowestoft Gas-Works—

"Mr. J. Ayris has one of Messrs. Kirkham, Hulett, and Chandler's "Standard" Washer-Scrubbers in operation (capable of dealing with 500,000 cubic feet of gas per 24 hours); and of the working of this machine he spoke very highly."

Estimates furnished for cost of altering original pattern Patent "Standard" Washer-Scrubbers, or for the supply of New Machines.

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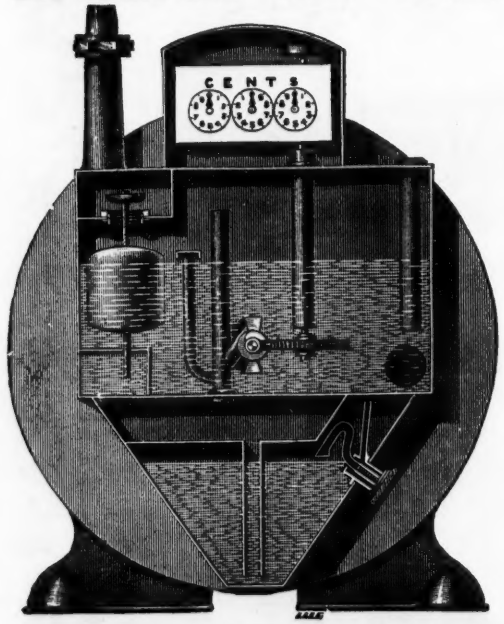
THE SYPHON OVERFLOW

— Wm. Cowan's Patent. —

To suppose, as some do, that the main object of the "Syphon Overflow" is to promote the convenience of inspectors and others who "water" meters, is to misapprehend the chief purpose of the invention. That the convenience of inspectors is promoted by the Syphon Overflow is a fact that admits of no doubt whatever, because the watering of meters is thereby greatly facilitated; but it is a mistake to fix attention upon this result, and to regard it as the only one attained. To do this is to lose sight of the chief purposes the Syphon Overflow was designed to secure.



These purposes were—

1st.—The **speedy** attainment of **exactly the same water line** on each occasion of watering.

2nd.—The **absolute certainty** of this water line being attained.

3rd.—The **impossibility** of any water afterwards finding its way into the waste-box.

The first and second of these conditions secure the interests of the gas company, whilst the third greatly promotes the convenience of the consumer, for reasons that are well known.

Who that has had experience of Wet Meters does not know the disadvantages of the "Low Spout?" The slowness with which it adjusts the water line, and the patience required while this is being done, are matters of every-day experience. It is therefore no wonder that the "Syphon Overflow" is regarded as one of the most important improvements ever made in the Wet Gas-Meter. It is not only an important improvement **in itself,** but it possesses the property of making all previous improvements more valuable and effective. It has, indeed, made the Wet Meter a more perfect, and, in every way, a more satisfactory instrument.

Narrow views as to price often prevent the adoption of real improvements; but it would be a narrow view indeed which would prefer a "Low Spouted" Meter to one with a "Syphon Overflow," because of the trifling difference in the price of the two.

— W. & B. COWAN, —

— ESTABLISHED 1827. —

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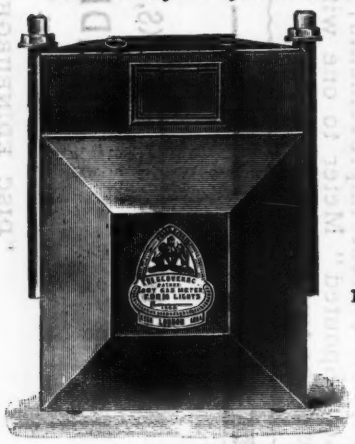
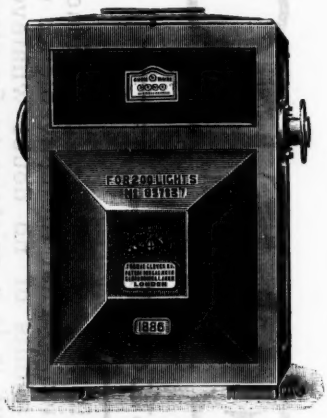


1st.—Are a remedy for all the defects of Wet Meters.
2nd.—Are suitable for all Climates, whether hot or cold.
3rd.—Incur no loss of Gas by Evaporation.
4th.—Cannot become fixed by Frost, however severe.
5th.—Are the most accurate and unvarying measurers of Gas.
6th.—Prevent jumping or unexpected extinction of the Lights.
7th.—May be fixed either above or below the level of the Lights.
8th.—Cannot be tampered with without visibly damaging the outer case.
9th.—Will last much longer than Wet Meters.
10th.—Will not cost more than one-half for repair that Wet or Water Meters do.

Are upheld for five years without charge.



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All the Meters (which number 14) at the Beckton Station of THE GASLIGHT & COKE COMPANY have been erected by the above Firm.

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[See also Advt., p. 80

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THE
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WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JANUARY 10, 1893.

A New South Metropolitan Development.

AN interesting step in the process of educating the workman to fit him for the right discharge of the responsibilities of his newly-found citizenhood, has been taken under the auspices of the South Metropolitan Gas Company. We learn that some time ago the Directors consulted together with regard to the possibility of enlisting the assistance of their workmen for the better prevention of accidents and casualties upon and about the works resulting in injury to the person or to property. It should be premised that the Board have adopted a policy in respect to the treatment of persons killed or injured in their service, which goes far beyond the provisions of the Employers' Liability Act; and, of course, all damage to their own or other people's property caused by their servants has to be made good out of the Company's own insurance fund. The general effect of this state of things has been to throw all responsibility for every sort of injury and damage upon the Company, while their power of controlling the influences which tend to produce such consequences was very limited. The Board might frame and issue rules and directions for the safe conduct of all the Company's operations; and their officers and foremen might do their best to see that these regulations were carried out in the spirit and by the letter. But, beyond this, there was a wide range for the action of the practically irresponsible workman. There is nothing exceptional in this condition of the South Metropolitan works; for everywhere it has been customary to treat the workman as a being in a state of pupilage, for whom rules and regulations must be framed without consulting him. There has been literally no attempt to awaken in the workman a sense of moral responsibility for prudent behaviour in regard to the various matters, incidental to his employment, for which his employers bear a responsibility both moral and pecuniary. That such an awakening is highly desirable need not be proved by argument. Apart from all private considerations of the fairness of asking a workman to assist his employers to bear a burden which is in a sense as much his as theirs, the matter must be treated upon the broadest grounds of public policy. To all intents and purposes, power in the land has been confided to the majority, who are wage-earners. It is of the highest importance that workmen should be instructed to appreciate and perform every duty of citizenhood that now falls to their share to discharge in common with those other orders of the community who have hitherto borne them. The possession of the franchise must be shown to mean more to the workman than the liability to be canvassed for his vote, and even than the duty of recording it once in seven years or so in favour of this or that candidate for Parliament. It is not enough to tell the workman, from the standpoint of superior culture and wider experience, that rational voters can exercise the right of free citizenhood more fruitfully than by attending mass meetings and marching through the streets in processions with bands and banners. These more profitable exercises must be brought to his notice; and he must be encouraged to perfect himself in the performance of all the public functions which were once beyond his reach, but are now inviting his collaboration. It is tolerably certain that the workman who comes to realize his position as a working member (in the political sense) of the community, will lose the taste for mass meeting fooleries.

Inspired with views similar to those which have been so scantily and feebly expressed in the foregoing paragraph, the South Metropolitan Directors conferred with the workmen members of the Committee of Management of the Profit-Sharing Scheme as to the desirability of establishing a jury system for inquiry into accidents and casualties as they occur in connection with the Company's operations. The subject was thus given a definite turn in a direction which the men could perfectly appreciate. After due consideration, the proposal was formally agreed to; and a set of rules for working the plan as nearly automatically, and with as little friction as possible, was drawn up. The arrangement is something like this: A jury list is compiled for every station, and for the outside hands, by their own immediate chief, in consultation with the men's representatives. Upon the occurrence of any accident or casualty involving loss of life, or so serious as to bring a sufferer upon the sick fund—that is, three days off the active list—or causing such damage to property as would form the subject of a special report by the Station Manager, the latter convenes a jury of twelve men from the list, drawing the names from appropriate classes of workmen. Thus, in the case of an accident to a stoker, six men out of the twelve would be stokers, the rest being taken from the yard and the shops; and so on. The Manager sits as "Coroner;" and the verdict is that of himself and his jury, precisely as in a Coroner's Court. It is duly filed for

the information of the Board; and copies are posted about the works, if thought desirable. Like ordinary Coroners' juries, these gas-workers' courts generally append to their statement of opinion as to how a casualty has happened, a recommendation aiming at the prevention of such catastrophes for the future. A recommendation of this character, when it happens to apply to a method of working, and constitutes a caution to the workers, has naturally greater weight with the men to whom it is addressed than a mere instruction posted "By Order" of the higher powers.

The plan has been in operation for too brief a time to demonstrate its value in a great variety of the cases that may be expected to arise in the ordinary working of a large gas manufacturing station. We understand, however, that so far the results have been most promising. It is not only that a jury of experts, as these men are in respect to the matters upon which they are required to pronounce judgment, has a power of getting at facts that might be withheld from a Manager making his inquiries unassisted; but the prospective and actual position of juryman creates and fosters in a remarkable degree the sense of responsibility in those to whom it falls, while the idea of being arraigned before, and censured by, a dozen of his fellows is something that the most reckless workman does not greatly relish. So long as any damage done was the Company's affair, such a man would look upon it in a different light from that in which it is presented in the sight of the whole staff by the deliberate judgment of those who, as partakers of the prosperity of the employers, are also injured by whatever causes them loss.

A cynic might remark that the test of this jury system will come when a verdict has to be passed in censure of the management. This is obvious enough; but it is not to be supposed that the South Metropolitan Directors have left such a possibility out of their calculations. A rich Company is often reprimanded by Coroners' juries composed of men nowise superior in standing to their own regular hands. But these juries are not in their employ. It is conceivable also that an officer of the Company whose conduct or prudence might be called in question by a works jury would have some means of protecting himself from having his acts canvassed by his subordinates. After all is said, the Board remain the only authority competent to revise the conduct of their officers. It would be easy to go on pouring cold water upon the latest development of the South Metropolitan policy of seeking common ground in the undertaking for employers and employed; but we do not intend to do anything of the kind here. At a time when so many demagogues who have the public ear are doing their utmost to separate wage-earners and wage-payers into irreconcileably hostile camps, it would be wrong to discourage the smallest attempts to exhibit the essential connection between capital and labour engaged in a common employment. This South Metropolitan device is not by any means an insignificant advance along a course in which the Company have already travelled far; and we wish them well on their journey.

A New Sulphur Standard for Suburban Gas.

THERE is an innocent-looking little clause in the tail end of the Crystal Palace District Gas Company's Bill which may prove a bone of contention as interesting as any other proposal of this experimental measure, if the promoters hang on to it with sufficient tenacity. It is a suggestion that the maximum proportion of sulphur in all forms in the gas shall be 30 grains per 100 cubic feet; and it is obvious that such a proposition is an overt act of defiance of the London Gas Referees and their regulations upon this head. If, as seems possible, the London County Council take part in opposing the Bill, they can hardly ignore this challenge of the principles they have inherited from the Metropolitan Board of Works; and there may consequently be some important doings over this brief clause. The Company may or may not be serious in thus threatening to revive the controversy over sulphur purification; but if they mean business in this matter, it is easy to forecast the lines upon which they will impeach the actual London standard of purity from sulphur. Their advisers will very probably argue that the Referees have overdone the sulphur restrictions, just as they have the testing for illuminating power, and have consequently imposed upon consumers of gas exposed to their tender mercies a grievous burden out of all proportion to common-sense requirements. It is open to be remarked that the Gas Referees have magnified their office beyond measure, and have fallen under the influence of a pedantic spirit to such an extent that they have changed from their original character of a salutary check upon the Gas Companies to that of an incubus on the consumers, who little know what they pay for carrying out the Referees' instructions. With regard to sulphur purification, we may expect the evidence for the Crystal Palace District Bill to contain some startling revelations as to the cost of working to the 15-grain limit; and the query will be put to the Committee whether the difference to the consumer between 15-grain and 30-grain standards is worth what it costs. One is justified in forming these anticipations from what is known of the opinions of Mr. George Livesey on the subject. As we understand his position, which is sometimes misrepresented—like many other aspects of this prominent personality—Mr. Livesey is not exactly a disbeliever in sulphur purification after the London standard, but he firmly holds to the opinion that, it being impossible to get rid of sulphur altogether, the importance to the consumer of keeping to a 15-grain as compared with a 30-grain limit is imaginary, while the expense of working to the former limit is excessive. As between sulphur-free gas and gas containing even 15 grains of sulphur in 100 cubic feet, the choice is one thing; as between 15-grain and 30-grain gas it is another. Gold can be bought too dearly, however; and even a Referee who could see his way to eliminating all the sulphur from gas would be apt to regard 5s. per 1000 cubic feet as too high a price to pay for such a luxury, seeing the rough uses to which so great a bulk of it is put. The argument applies equally well to the case of 30-grain, as compared with 15-grain gas; and there can be no objection to a re-hearing of the general question. Our own opinion upon the subject is well known; and it is not wholly in accord with that of Mr. Livesey. We believe—and we said as much in commenting upon Mr. C. C. Carpenter's Southern District Association paper, read in November last—that the difference between 40 grains and 15 grains of sulphur is worth paying for, as would be gas absolutely sulphur-free if this ideal could be attained at reasonable cost. We cannot bring ourselves to accept the principle that a low selling price is everything in a gas supply; and we are certain that the sulphurous products of burning coal gas do constitute a serious drawback to the popularity of gas as an illuminant. All the same, we freely admit that the public should know what sulphur purification means to them, in point of cost. There is good reason for believing that if the London County Council were to get possession of the Metropolitan Gas Supply to-morrow, before the year was out they would become as tolerant of sulphur in gas as the Corporations of Manchester and Birmingham. Local Authorities have no money to throw away upon sulphur purification; but they like making Gas Companies do it—forgetting that it is the consumer and ratepayer upon whom the cost of the process actually falls. For the sake of the controversy it is sure to arouse, we hope the Crystal Palace District Gas Company will stick to their 30-grain clause.

"Down Tools" at Rotherham.

THE story from Rotherham which will be found in another part of the JOURNAL is an instructive illustration of New Unionism in action. We know from newspapers, magazine articles, and mass-meeting orations what this New Unionism is in theory, and how it is the latter-day product of Socialism, and half-a-dozen other "isms" expressing the "Rights of Man." It has been our constant endeavour to exhibit this remarkable movement from a side which "popular" politicians as persistently try to ignore; and our readers will therefore not be unprepared for this further statement of how the gas stokers' Union works in a place where the Gas Manager has honestly striven to bear with it. At Rotherham, on Christmas Eve, the night foreman came on duty intoxicated. On this being reported next morning to the Engineer (Mr. C. B. Newton), the foreman received his dismissal. When the night shift came on in due course, and heard of what had happened to the man, who belonged to the Union, they held a meeting with the off-going shift, and decided, at the instigation of the Branch Secretary of the Union, to "down tools" unless the foreman was reinstated. Mr. Newton was called to the works, and at 10 p.m. found the retort-house standing idle, the malcontents gathered in the mess-room, and only three hours' stock of gas in the holders. In these awkward circumstances, the Engineer

stood firm, and warned the men of what would happen to them if they persisted in their refusal to carry out their legal engagements. After about two hours' debate among the men as to what should be done, prudent counsels prevailed, and work was resumed. Upon the matter being submitted to the Chairman of the Gas Committee, it was decided to take proceedings against the whole of the men composing the night shift and the Branch Secretary; and they were accordingly summoned. Thereupon the President and Secretary of the Gas Workers' Union for the Sheffield district were instructed from the London office to seek an interview with the authorities, with a view to arranging a settlement. These Union officials, to do them justice, upon being granted a hearing, admitted that the men were in the wrong; and they pleaded for the withdrawal of the summonses, which was promised on condition of the offenders sending in a written apology, and paying the legal costs. This the unofficial strikers did, and were pardoned. But the Branch Secretary refused to submit; and his case consequently stands in abeyance. This man had become so permeated by the spirit of the New Unionism that he took upon himself, on the night of the strike, to advise the Engineer to consult the men before discharging a member of the Union. The incident is closed so far as the preservation of the authority of the Manager is concerned; but it shows how inimical to good working is the attempt to erect a dual authority in gas, or in any other works. It is all very well for Union officials from a distance to express disapproval of such conduct as that of the Rotherham night stokers; but this would not have kept the holders afloat. These "down tools" incidents, which occur in Union-ridden gas-works far more frequently than they are reported, are the result of that cultivation of the idea of "Jack being as good as "his master" which is one of the main points in the New Unionist charter, and is one of the chief attractions of the movement in the eyes of the ignorant. If, in the poet's line, "Order is Heaven's first law," it is the last thing that the Gas Workers' Union helps to establish in the works under its domination.

A Leaguer Released.

It reads quite like old times to find a Cobden figuring in connection with a "League," and the savour of antiquity is not lessened by the further discovery that the League with which this particular Mr. Cobden is identified is a "Gas and Water" affair. How refreshing it is to hear that the form of agitation for the alteration of the laws relating to gas and water supply has not perished, even though the spirit of such movements has departed! The truly remarkable thing is that anybody professing to be a gas reformer should still be able to extract subscriptions from the credulous public. Yet this is precisely what Mr. Gedge Long Cobden has been doing for the past 18 years. The gross amount of Mr. Cobden's subscription list for this lengthened period has not been published; but he might have gone on collecting signatures and odd shillings from ignorant and dissatisfied gas consumers for an indefinite time longer, if one of his patrons had not charged him at the Westminster Police Court with obtaining money under false pretences. We have elsewhere reported the case as fully as it deserves, and have only to state here that in dismissing the accused the Police Magistrate confessedly took a merciful view of the circumstances. It was a question of what constitutes a false pretence; and, as the proceedings are reported, it cannot be said that Mr. Cobden was technically guilty of this offence. He had taken the precaution of preparing a petition to Parliament, as the first step in the way of reform; and if he asked for help towards paying the expenses of carrying on his movement, there is no false pretence about it. People give to beggars of this description with their eyes open. What amount of moral justification such an individual has for leading such a career, beyond the hackneyed excuse that "a man must live," is another question. We would fain have flattered ourselves that the gas reform leaguer, like the gas-burner sharp, had vanished from the streets of our towns—their calling having been rendered unremunerative by the spread of education among the shopkeeper class, upon which they formerly preyed. But the facts militate against this comfortable belief. Let us hope still that, if not quite extinct, industrious individuals of the Bayswater Cobden's persuasion are becoming so few and far between as to be harmless.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 71.)

The New Year has not thus far brought with it any improvement in enterprise upon the Stock Markets. Things in the opening week have been decidedly quiet; and the large bump of caution exhibited by the many-headed public still prevails to deter them from having anything to do with aught that is at all of a speculative character. So the general tendency of prices was downward for lack of support. Among the depressing influences are not only the Panama difficulty abroad, but the signs of impaired business at home indicated by reduced dividends of banks and railways. While, however, speculation has been at a discount, all the gilt-edged securities are at a higher premium than ever. The Money Market has shown a continued plethora of money, and in some quarters a reduction in the Bank rate was contemplated among the possibilities; but Thursday went by, and the Directors made no change. Business in Gas has been fair, with a strong tendency all round; several advances in quotation having been effected without a single retrograde movement. A revulsion of feeling in favour of Gas securities is slowly but surely coming home to the minds of the public; and there is a fair prospect of a general advance in the position of the leading undertakings. The parliamentary returns showing the business actually done by the gas undertakings of this country, coupled with the sinister revelations which have recently thrown a light upon the real state of the affairs of some Electric Lighting Companies, have set people thinking whether good Gas stocks at anything like the present prices are not about the best and most promising things in the market. In the course of the past week, Gaslight "A" has crept up 2 more; and business was done on Friday at 227. The debenture and preference issues have been irresistibly forced up by the demand for investment securities. South Metropolitans have been very quiet—all remaining firm and unchanged. The same may be said of Commercials. More activity was apparent in Suburbans and Provincials, especially in Brentfords; the old quotations holding good. The Continental Companies have made further improvements—Union gaining 2; and Imperial, 1½. Among the rest, the only changes are in Australian and Buenos Ayres bonds, each of which comes out better *ex div.* The Water Companies continue to advance steadily in favour; several issues showing moderate improvements upon their previous week's figures.

The daily operations were: Business in Gas was good, though not very extensive, upon the reopening on Tuesday. Gaslight secured issues were specially in demand. Southwark Water rose 2. Wednesday was much quieter; but prices were on the rise. Gaslight "A" and 4½ per cent. debenture advanced 1 each. East London Water went up 1; and Lambeth 10 per cents., 2. Thursday's transactions were limited; but the upward movement in prices was carried on. Gaslight "J" rose 1; ditto, 6 per cent. debenture, 2; and Imperial Continental, 1½. Water advanced freely—Southwark and West Middlesex gaining 3 each; and Lambeth 7½ per cents., 1½. Friday was brisk and buoyant. Gaslight "A" rose 1; and Continental Union, 2. Saturday was quiet and steady; all quotations closing without further change.

ELECTRIC LIGHTING MEMORANDA.

The St. Pancras Central Station Lighting—Chemists and Electric Lighting—Central Station Charging Systems.

Mr. T. Eccleston Gibb, the Vestry Clerk of St. Pancras, has presented to this enterprising body a report upon the first year's working of the electric lighting undertaking. Like a good many other official statements, this report makes a great display of figures which at first sight appear to disclose everything; but, upon close examination, they leave a good deal of information to be desired. It is certain, however, that, upon works completed and in progress, the Vestry have incurred a capital expenditure of £91,493. The gross revenue earned by the station up to the date of closing the accounts was £7620, and the running expenses amounted to £6552, which does not include any allowance for depreciation, to say nothing of interest, rents, rates and taxes, or administration charges. It is instructive to note that, when the Vestry decided to adopt the scheme propounded by their Electrical Engineer, the capital outlay was estimated at £55,000; but the project developed growth rapidly after it was taken in hand, and especially in regard to distribution expenses—the mains having to be stretched here, there, and everywhere in search of business, which obstinately refused to be bound by the Engineer's ideas of a convenient distributing area. One result of this disagreement between the expected and the actual is, as admitted in the report, that "nearly two-thirds of the capital expended on trenches and conductors—say, £20,000—is lying idle, and must continue to do so until further generating plant is put down at the station." Here we have the old story of an open capital account that refuses to be closed in accordance with original estimates. The accounts do not give the number of units supplied; but as they stand, they supply an instructive commentary upon the estimate published in the Journal for Jan. 28, 1890 (p. 157). Here the cost of the station was to be less than £50,000; and the annual cost of producing 825,000

units was to be £9400, in which depreciation and rent, amounting together to £3800, were included—leaving £5600 for such running expenses as are embraced in the present report. As already stated, there is no information respecting the quantity of electricity actually supplied last year from the works; but it is safe to assume that it must have fallen very far short of the estimated maximum. Whatever the amount, the cost of coals was within a trifle of the Engineer's maximum; having been £2306 as compared with £2500. Salaries and wages exceeded the estimate—having been £2990 as compared with £2600; and the estimate of £500 for water, oil, waste, and petty stores has proved lamentably insufficient. Moreover, the imaginary demand for electricity for motive power has not come to the assistance of the undertaking. Mr. Gibb still hopes, of course, that the venture will turn out satisfactory; but as this anticipation is based upon the expectation that the works will be fully employed and that every prospective 16-candle lamp, charged at 6d. per unit, will bring in a revenue of £1 a year, even the *Electrician* is driven to confess that "this statement is, indeed, worthy of an electrical expert." We look for lively times in St. Pancras when things electrical have ripened a little more.

Our interesting contemporary the *Electrical Review* has gone into somewhat extravagant raptures over the circumstance, by no means very wonderful on the surface, of the Council of the Chemical Society having renovated the Society's lecture theatre during the recess, and substituted electricity for gas as the means of lighting. We are told that, "in order to appreciate the true significance of this deposition of gas in favour of electricity, it must be borne in mind that a large percentage of the Fellows are directly interested in gas, and in the bye-products arising from its manufacture." Several other considerations of the same character are also enumerated; and the remarkable, not to say amusing conclusion is drawn from the whole, that "this action of the Chemical Society is one of the most severe blows which the gas companies have yet sustained, and will be regarded by electrical engineers as a splendid testimonial." Electrical engineers may take what comfort they are able to obtain from any particular installation of electric lighting, and welcome. Why they should plume themselves more upon the fact of some electrical supply company having added the head-quarters of the Chemical Society to their list of consumers than upon the same circumstance happening in regard to a theatre, is difficult to understand. Every lighting connection is, in its degree, an advertisement as well as a source of income, whether the means employed be gas, or oil, or electricity. We should have thought that the electric lighting industry of London had had quite enough glory in the shape of advertisements and testimonials from sources even more conspicuous in the eye of the world than the Council of the Chemical Society, and that what they stand in most particular need of is "pudding," not "praise." If the electricians can make anything considerable out of the Chemical Society, they may be congratulated thereon; but it is too ridiculous to lay stress upon the "blow" sustained by gas companies through the action of a few chemists in following the fashion, and lighting their meeting-rooms by electricity. Supposing what our contemporary states of these gentlemen to be true, and that many of them are closely interested in gas, might it not be as reasonably concluded that their object in patronizing electric light is that of being able to play the critic of electricians' performances? But apart from this sufficiently obvious reflection, is it to be argued that a butcher must never eat anything but meat, or a brewer drink nothing but beer? What would our contemporary say of the spectacle of gas managers dining, and dining well, by the light of electric lamps? Such an experience ought, according to its way of thinking, to extinguish a mere gas man's appetite; but singularly enough, it has never been known to have this effect.

Discussion upon the subject of the best method of charging for electricity supplied by a central station company still goes on in the electrical journals. The companies have long looked askance upon independent private installations, which take the cream of their possible trade; and now they are finding out that these installations are capable of doing them greater harm than merely taking away their best custom. It is bad enough for a central station company when the banks, the clubs, and the largest public institutions in the district elect to supply themselves with electricity; but it is adding insult to injury when these selfish customers go further, and take advantage of their position in an area of compulsory supply to insist upon their right to a connection with the Company's mains—intending to use it merely as a stand-by in case of failure of their own plant. In this way it happens that a central station may have the balance of producing and distributing power rudely disturbed at a moment's notice, without anybody knowing why or wherefore. This is a condition of affairs which the central station engineer greatly dislikes, but against which he has no remedy. It is not to be wondered at that central station administrators should seek some means of making "stop-gap" customers pay dearly for the luxury; but the difficulty is in finding a workable device to this end. It would not matter so much if the extra and accidental business came when the mains were not otherwise loaded; but when, as most generally happens, a few hundreds or thousands of lamps that have never paid a penny rental for months are clapped on the mains just when every regular customer wants his maximum supply, it does seem hard the circumstance cannot be reckoned for in the bill.

GAS BILLS FOR 1893.

In pursuance of an annual custom, we now present a synopsis of the provisions contained in, and the objects intended to be secured by, the Bills relating to gas supply which have been deposited in the Private Bill Office.

The only Bill for incorporating a new statutory Gas Company is that of the New Swindon Gas Company, which was formed in 1862 for the purpose of supplying the district of the Swindon New Town Local Board, in Wiltshire. The capital of the limited Company consists of £30,000, in £1 shares, of which 17,000 have been issued, all paid up; and £15,000 has been raised by way of loan. The Company state that they have expended upwards of £30,000 upon their works. The Bill defines the area of supply, and proposes in the usual form to dissolve and re-incorporate the Company; putting the authorized capital at £60,000, whereof £30,000 is to be original. Within twelve months after the passing of the Act, it is proposed to issue at par 13,000 old shares (being the balance of the original capital) to the present shareholders, in proportion to their holdings of the 17,000 old shares; the proceeds of this operation to be applied to paying off the mortgage debt to the extent of not less than £7500, and further in improving and extending the undertaking. The additional capital is to be raised under the auction clauses, with the condition that the whole amount of any sale, with the premium, is to be paid to the Company within three months of such sale. Borrowing powers are asked for to the extent of £7500 in respect of the whole capital, and one-fourth of the amount of the new capital as issued. Additional lands, not exceeding four acres in extent, may be purchased by agreement, but not for manufacturing purposes. Interest after the rate of 4 per cent. will be payable on deposits; and subject to the same condition, prepayment of rental is to be legalized in certain instances. The initial price of 4s. 9d. per 1000 cubic feet is asked for; the quality of the gas being put at 14 candles.

The Accrington Gas and Water Bill is to enable the Company to raise £200,000 of additional capital, to bear a 7 per cent. dividend, with borrowing powers to the extent of one-fourth of the amount of new capital called up. The Altrincham Gas Bill is to authorize the Company to acquire additional lands for the extension of their works, and to raise £40,000 more capital to bear a 7 per cent. dividend, with the usual borrowing powers. It is proposed to reduce the price of gas sanctioned by the Act of 1872 to the standard of 3s. 10d. per 1000 cubic feet, the illuminating power being 16 candles. Discounts not exceeding in any case £20 per cent. per annum are to be allowed to consumers in consideration of prompt payment or large consumption. The Company seek powers to construct a tramway connecting their works with the railway. The powers of the Company for the compulsory purchase of land are only for one year; and the tramway and works are to be completed within two years, and worked by animal power only. The Company desire facilities for the establishment of a superannuation or pension fund, and its application on the retirement of their officers and servants. The Brighton and Hove Gas Bill recites in the preamble the circumstances under which the united undertaking arrived at the present capital of £590,000, the whole of which has been issued and paid up, with the exception of a sum of £1900 of share, and £18,800 of loan capital. The Company desire to enlarge their works at Shoreham Harbour by the acquisition of five acres of adjoining land, and to extend their district of supply by the inclusion of the parishes of West Blatchington, Hangleton, Poynings, and Newtimber. It is also proposed to raise £300,000 of additional capital, bearing a 7 per cent. dividend, and carrying the usual borrowing powers. The Crystal Palace District Gas Bill contemplates a radical rearrangement and substantial increase of the capital of the Company, which dates its existence from 1858, when it began operations with an authorized capital of £50,000. It now consists of £75,000 with a 10 per cent. dividend, £275,000 with a dividend of 7 per cent. as ordinary capital, and £50,000 with a preference dividend of 6 per cent.—together amounting to £400,000, all paid up. All the ordinary stock, totalling up to £350,000, is to be converted into an equivalent amount of £535,000 as consolidated ordinary stock with a uniform dividend of 5 per cent. The £37,500 of 6 per cent. debenture stock already raised is to be changed into an equivalent amount of £45,000 of 5 per cent. debenture stock. Additional consolidated ordinary stock to the amount of £200,000 is to be raised, in lots of not less value than £5. The new stock is to be sold by auction or tender to the public, or to the consumers of gas in the Company's district and to the Company's employees, in such manner as may be determined. If not sold at the reserved price, the stock is to be offered at the same price to existing stockholders, before submitting it publicly again at a lower reserve. All stock so sold is to be paid for within three weeks. Premiums are to be treated in the ordinary way, with the proviso that in any case where power to raise money by debenture stock or to create an insurance fund is made proportionate to the paid-up capital, the premium capital is to be reckoned as part thereof. An initial price of 3s. 6d. per 1000 cubic feet is asked for, with a rise or fall of 2s. 6d. per cent. of dividend for 1d. off or on the selling price of gas. Power is sought for the creation and issue of debenture stock

in such proportions and instalments as shall make it equal to one-third part of the paid-up capital, including premiums. A Director's qualification is to be the possession, in his own right, of £2000 of consolidated ordinary stock. It is provided that the gas supplied by the Company shall not contain more than 30 grains of sulphur in any form in 100 cubic feet. Permission is sought for the conclusion of an agreement with the South Metropolitan Gas Company for the use of their landing-stage at East Greenwich; and also for amalgamation of the undertaking with that of any Metropolitan Gas Company on the south side of the Thames, subject to the regulations prescribed by the City of London Gas Act, 1868, and to the sanction of the Board of Trade, notwithstanding the prohibition of the 64th section of the South Metropolitan Company's Act of 1876. The Goole and District Gas and Water Bill is to enable the Company to raise £30,000 of additional capital, bearing a 7 per cent. dividend, and carrying the usual proportion of borrowing powers. The gas-works originally belonged to the Undertakers of the Aire and Calder Navigation, from whom they were acquired in 1881; and sanction is given for the Undertakers and the Local Board to subscribe one-third each of the new capital. Additional lands are to be acquired, and extensions of manufacturing plant made thereon, within a time-limit of ten years. Power is sought to apply for an Electric Lighting Order. Several clauses are inserted for the protection of the Aire and Calder Navigation.

The Imperial Continental Gas Association Bill is to extend the borrowing powers of the Association, mainly with a view to the completion of their new Amsterdam station, for which purpose a special loan of £500,000 was authorized in 1884. This amount having been found insufficient, it is now desired to increase the borrowing powers to a sum not exceeding at the time of issue one-fourth part of the paid-up capital of the Association. A clause is inserted in the Bill declaring all unclaimed dividends forfeitable to the Association after a period of ten years. The amount of the paid-up capital is stated to be £3,800,000.

The Staines and Egham District Gas and Coke Company's Preference Capital Bill is a measure of one operative clause, rendered necessary by peculiar circumstances. The Company was originally formed in 1833 under a Trust Deed; the capital being £3800, in £25 shares, with power of increase by resolution of a majority of not less than two-thirds of the shareholders at a general meeting. The Company was registered in 1870, and incorporated by a Provisional Order in 1871, with a capital limited to £16,000. In the year 1881 another Order was obtained authorizing the raising of £14,000 of additional capital, which contained a clause limiting the profits of the Company to the usual prescribed rates of dividend. In 1883 it was resolved to increase the capital by the issue of 80 preference shares of £25 each, to bear interest at the rate of 5 per cent. per annum; and a further issue was made in 1884. Doubts having arisen as to whether the creation and issue of these preference shares was within the powers of the Company, this Bill is promoted to legalize the operation. The Wolverhampton Gas Bill is to enable the Company to raise £80,000 of additional capital, to bear a 7 per cent. ordinary or a 5 per cent. preference dividend, and carrying the usual borrowing powers. The limits of supply are to be extended so as to include the parishes of Bushbury, Penn, and Codsall; and new works are to be constructed on lands to be acquired within three years. The Company desire to construct a canal basin in connection with the Birmingham Canal, and to sell the site of their Horseley Fields works. The existing 6 per cent. preference shares of the Company, to the amount of £49,480, are to be converted into preference stock.

The Barry and Cadoxton Local Board (Gas and Water) Bill provides for the purchase by the Local Board of the undertakings of the Barry and Cadoxton Gas and Water Company. The clauses of the measure are of a general character; no agreement as to terms, &c., being scheduled. The Pontypool Local Board (Gas) Bill is to authorize the Local Board to purchase the undertaking of the Gas Company in accordance with the terms of a scheduled agreement. The price of the works is £35,000. The capital of the Company is £6000 in original £10 shares, and a sum of £3000 in irredeemable debenture stock bearing 7½ per cent. interest. The site of the works is leasehold. The purchase does not include debts due to the Company, or any cash in hand; and the Local Board pay all the Company's costs in connection with the transfer. The Local Board desire to borrow £60,000 in addition to the price of the old works, for the purchase of land and the construction of a new manufacturing station. Gas of 14-candle power is to be supplied by the Local Board at a maximum price of 6s. per 1000 cubic feet, with power to allow discounts up to 20 per cent. The Todmorden Local Board Gas Purchase Bill is to authorize the transfer to the Local Board of the undertaking of the Todmorden Gas Company, together with those of Messrs. Fielden Bros., Limited, and Messrs. Wilson Bros., Limited, according to the terms of scheduled agreements concluded between the respective parties. The property of the Gas Company is to be bought up, "all standing" as it shall be on March 31 next, for the sum of £66,462 10s.; and a mortgage debt of £10,000 is also to be taken over, and all expenses paid. The private undertakings are to be dealt with in a manner that does not admit of intelligible abstracting from the scheduled agreements, which bristle with considerations of purely local interest. The Board propose to borrow £150,000 for the purposes of the Bill. Gas of 16-candle power is to be supplied at a price which is not stated; but a scale of discounts running up to 12½ per cent. is inserted. The Barnoldswick Local Board Bill is to authorize the acquisition by the Local Board of a gas undertaking for which a Provisional Order was obtained in 1890 The capital of the Company consists of 1200 ordinary £10 shares, upon which £6 has been paid up; and there is a mortgage debt of £1800. The agreement for the transfer is scheduled. It provides for the payment of £13,850, and the invoice prices of all stocks—the gas in the holders being priced at 2s. per 1000 cubic feet. The Barnoldswick Gas Order is to be repealed. The maximum price for 15-candle gas is to be 6s. per 1000 feet.

The Aberdeen Corporation (Gas and Water) Bill is to enable the Town Council to borrow £90,000 for the purpose of their gas undertaking. Additional lands are to be taken within two years for the storeage of gas. The St. Helen's Corporation Bill contains clauses authorizing an extension of the gas-works and the acquisition of additional lands. The Stockton-on-Tees Corporation (Gas) Bill is to extend the limits of supply and enable the Corporation to acquire additional land for gas purposes; and also to borrow £68,000.

Although it does not relate to gas supply, the Bill of the Brighton and Hove Electric Light Company may be mentioned here. It is an attempt by the Company to secure by Bill that statutory protection and recognition which the Board of Trade, in consequence of the opposition of the Brighton Corporation, have refused to give them by way of Provisional Order. There is no other novelty in the measure.

Gas Power for Electric Lighting.—At the Institution of Civil Engineers this evening, Mr. J. Emerson Dowson will read a paper on the above subject.

Mr. W. A. Valon a Justice of the Peace.—Last Saturday, Mr. W. A. Valon, Assoc.M.Inst.C.E., Gas and Water Engineer of the Ramsgate Corporation, was appointed a member of the new Commission of Peace for that borough.

Society of Arts.—Next Friday, Professor W. Cawthorne Unwin, F.R.S., will deliver, at the Society of Arts, the first of a special course of six lectures, under the terms of the Howard Bequest, on "The Development and Transmission of Power from Central Stations."

Projected Amalgamation of the Harrow and Great Stanmore Gas Companies.—A project is on foot for the amalgamation of the Harrow and Great Stanmore Gas Companies; and the shareholders of the former Company will be called together on the 23rd inst. to consider the matter.

Trade in Lighting Appliances in Russia.—According to the *Commercielle Berichte*, large numbers of lamps, gas appliances, and chandeliers continue to be imported into Russia, notwithstanding the increased duties. Attempts to make gas-lamps at Warsaw have, it is reported, been unsuccessful.

Mr. H. L. Cripps, the author of the work on "The Position of the London Water Companies," lately issued as a report to the London County Council, and noticed in our columns at the time, has been elected President of the Society of Parliamentary Agents, in succession to Sir T. Martin, who has filled the position for the past four years.

Institution of Civil Engineers.—According to the new list of members of this Institution, which has just been issued, there are at present on the books 5122 corporate members, of whom 1795 are members, 3312 associate members, and 15 honorary members, besides two other attached classes—viz., 389 associates and 830 students; making a gross total of 6341, against 6131 at the same date last year.

The "Turbine Manual."—We have received from the author (Mr. C. L. Hett, Assoc.M.Inst.C.E.), a copy of his "Turbine Manual and Millwright's Handbook"—a little work in which he has endeavoured to supply information required by those who are called upon to arrange turbines for the utilization of water power, as well as by millwrights and engineering students. It is published by Messrs. E. and F. N. Spon.

The Boring for Coal at Dover.—In the course of the address delivered by Sir E. W. Watkin, M.P., when presiding at the recent meeting of the Channel Tunnel Company, he referred to the boring for coal which is now going on in connection with the tunnel works. He said there was no doubt as to their having made a discovery of coal; and a good deal of their success in regard to working it would depend upon two public departments—the Ecclesiastical Commissioners and the Commissioners of Woods and Forests—which owned extensive areas of land in the vicinity. The South-Eastern Railway Company also had a largequantity of land which would enable them to work. But it was not enough; and what the Tunnel Company wanted was to have control of the whole coal-field. They ought to have this control; and if he did not see his way to get it, he would not feel inclined to recommend the Company to lay out another sixpence. He could not, however, believe that enlightened men in an industrial country would do anything except aid to the utmost of their power in what was, after all, the fruition, or attempted fruition, of what had really been a grand discovery.

NOTES.

The Presence of Iron Carbonyl in Coal Gas.

M. Guntz has communicated to the *Bulletin* of the Chemical Society of France some observations (briefly referred to in the JOURNAL for Aug. 9 last) respecting the probability of the presence of iron carbonyl in coal gas. He states that the lamp-glasses of burners consuming gas made at the Nancy works, when used for a moderately long time—say, from 40 to 100 hours—without being cleaned, became covered with patches which were at first white, and ultimately showed a reddish colour. On analysis these patches were found to consist of oxide of iron. Similar patches have been observed on porcelain caps placed over gas burners, and on porcelain plates forming part of recuperative burners. The gas must, therefore, contain a volatile compound of iron. M. Guntz remarks that this is rendered more probable when the method of purifying gas by oxide of iron is taken into consideration. At Nancy, the gas is stated to be purified by a mixture of calcium sulphate, oxide of iron, and sawdust, which when saturated with sulphur is freshened up by the addition of iron turnings. The excess of iron in the mixture is acted upon by the carbonic oxide always present in the gas; and iron carbonyl is formed in small quantity. This hypothesis is supported by the fact, vouched for by M. Guntz, that in a town on the outskirts of the City of Nancy no ferruginous deposits of the kind described were perceived before the local gas-works began to use the purifying mass before mentioned. A few days after the change had been made, the lamp-glasses became reddened by deposits of oxide of iron.

Dangerous Steam-Cock Plugs.

Mr. A. J. Wilton, of the Silvertown Works of The Gaslight and Coke Company, has written to *Industries* on the construction of steam-cocks, with the object of warning engineers and works foremen to have their steam-cocks examined and tested before being issued for use in connections subjected to high pressures. Mr. Wilton points out that there is a good deal of competition among makers of steam-fittings; and this has led to their attempting to turn out good and reliable articles with the greatest possible saving of metal. It is in regard to the latter consideration that care is necessary; for Mr. Wilton sent to our contemporary for inspection a plug of an ordinary 1-inch straightway steam-cock of gun-metal, the square key-head of which blew off while a man was in the act of turning it with a spanner. The bursting of this cock nearly cost the man his life; the piece of metal flying through the air like a shot from a gun. Examination of the broken plug showed that at the shoulder, where the square head joined on to the top of the taper body of the plug, instead of there being a substantial thickness of metal to bear the strain of a spanner, it had been hollowed out until a mere shell, barely $\frac{1}{16}$ inch thick, remained. This, of course, would not appear to anybody looking at or handling the cock in the usual course, but could only be discovered by special measurements of the plug inside and out. Mr. Wilton has done well in calling attention to this liability to hidden weakness in steam-cocks.

Dew and Fog.

Some seasonable interest attaches to the observations on dew and frost of the Hon. R. Russell, which have recently been published in pamphlet form. The author describes a number of experiments of his own devising, and summarizes results obtained by others which throw light upon the causes of dew and frost, and, incidentally, of fog and mist. Reference is made to the researches of Mr. J. Aitken upon the meteorological effects of dust particles in the atmosphere. Air may be supersaturated with moisture when the number of dust particles is unusually small in a mass of air which is humid and cooled to saturation. The dust particles, from their minuteness, and also from their inability to fall below the temperature of the air owing to the cloud canopy above, do not condense much of the vapour; and consequently any solid object of the same or slightly lower temperature brings about precipitation from the passing air, which may be supersaturated. A slight fall of temperature in the air, or sometimes an increase of dust particles, then produces fog. A dry fog may thus result from cold causing condensation on a very large number of dust particles which are radiating heat rather freely, and a damp mist from partial condensation from supersaturated air on a comparatively small number of dust particles not radiating freely owing to a cloudy sky. These considerations explain why a dry fog is densest in London, and a wet mist densest in the country. A dry fog is the work of cold radiating particles; a wet mist is the work of cold air mixing with warm. In a fog, according to Angus Rankin, the watery vapour in condensing has more particles to condense upon, and consequently the particles of fog are smaller; and on meeting with an object at a higher temperature, instead of wetting it, the object dries them up by parting with some of its heat. On the other hand, in a mist, the particles of dust, being few, have more water condensed on each, and so are larger, and do not readily evaporate with small increments of heat. In fact, the wet mist is less dense in London than in the country, owing to the higher temperature and lower humidity of the air. Dry or radiation fogs, which cling to the ground, are most dense in smoky places. Dew and frost—and fog and mist—are, in fine, the result of many causes which inter-operate in a complex manner.

COMMUNICATED ARTICLE.

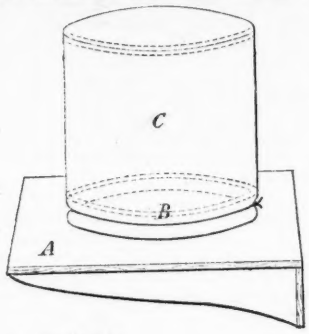
EXPERIMENTING WITH A VIEW TO THE DEVELOPMENT OF GASHOLDER CONSTRUCTION.

FIRST ARTICLE.

By F. Southwell Cripps, Assoc.M.Inst.C.E.

Mr. E. Lloyd Pease's interesting communication in the last number of the JOURNAL, on "The Strength of Gasholders Constructed of Brown Paper," recalls to my mind a series of similar experiments I made about four years ago.

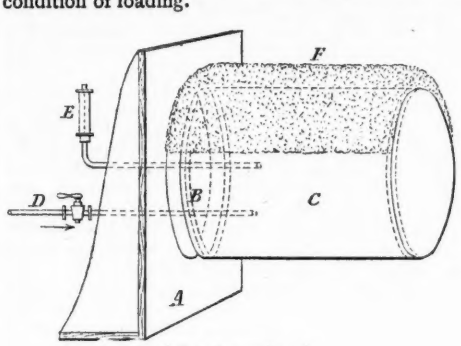
I constructed gasholder shells of brown paper, 1 foot, 2 feet, and 3 feet in diameter respectively, and 4 feet high, and painted them all over to make them gas-tight. The top curb was constructed of an ordinary wooden hoop, and the bottom was firmly fixed to a wooden base, as shown in fig. 1.



A Wood base.
B Raised wood curb groove to which cylinder is lashed.
C Brown paper gasholder.

FIG. 1.

In order to get the effect of wind pressure, the base of the holder was placed in a vertical position, so that the holder itself extended in a horizontal direction as a cylindrical cantilever. It was filled with gas through a pipe passing through the wood base, and then loaded evenly with sand to represent wind pressure. The sand was added gradually, until rupture took place; the total load being afterwards weighed. Fig. 2 represents the condition of loading.



D Gas-inlet pipe and cock.
E Pressure-gauge.
F Sand loading (wind pressure).

FIG. 2.

FIG. 3.

A pressure-gauge was fixed at the back of the vertical board, and the pressure was maintained constant. The effect under different pressures was likewise noted. The brown paper was also carefully tested. Strips 1 inch wide were employed for the purpose; and these were glued between wood clips at each end, as in fig. 3.

In the account given of Mr. Pease's experiments, it is stated that the base of the holder was held down by weights. These must have been sufficient to prevent the whole mass tilting bodily. Therefore, in effect, the base of the holder was "fixed," and the conditions under which the experiments were made were practically the same as for those carried out by myself, and described above.

As regards the manner of loading in Mr. Pease's experiments, however, I do not consider the *strap* a very satisfactory method, inasmuch as the force is distributed over the surface of the holder by stiff vertical strips or laths, which really might be looked upon as "vertical stays." Neither is it correct to distribute the wind pressure uniformly on the rounded surface. It should die off on either side. In my experiments, I think the distribution of sand is somewhat preferable. With this difference, the experiments made by Mr. Pease and myself may be considered as practically identical.

But now as to the conclusions drawn from the experiments. Mine are entirely at variance with Mr. Pease's, and for this reason—that *the experiments do not truthfully represent the actual condition o things*. At first sight, when I started making my

experiments, I certainly thought that the arrangements made would represent somewhat satisfactorily the conditions of a gasholder without guide-framing, when inflated and subjected to wind pressure. But, on closely examining the experiments, I soon discovered that I had lost sight of the following fact—that, when the model holder was inflated with gas, and the sides were in tension from top to bottom (due to the pressure of the gas upon the crown), the holder, being fixed at the base, resisted this upward pull with a force exactly equal to the total pressure of the gas on the crown. Therefore the tension in the side sheeting was practically uniform from top to bottom.

Now, as a matter of fact, we know that *an actual gasholder does not exert any lifting force at the bottom curb;* there is no vertical tensile strain at the base, due to upward pressure of gas or weight of sides. There is at the top; but it gradually decreases to *nil* at the bottom. Hence, we cannot consider a gasholder to be anchored down with weights all round the base (as in Mr. Pease's experiments); it is merely floating. If Mr. Pease will load the *crown* of his model gasholder with just sufficient weight to overcome the pressure of gas and no more, leaving the base entirely unweighted, as it is in actual fact, his experiments will accord more approximately with the actual condition of things; and I do not doubt that the conclusions he has previously drawn from his experiments will then be considerably modified.

The Brussels Electric Lighting Scheme.—The contract for the electric lighting scheme for Brussels has been duly signed with the India-Rubber, Gutta-Percha, and Telegraph Works Company of Silvertown; and the station is, we learn, to be in going order by October next. When complete, it will be capable of working up to a maximum of about 3600-horse power, with a minimum of 3000-horse power. The normal capacity of the accumulators will be 1250 16-candle power lamps. The station will be situated in the Place Ste. Catherine, near the Boulevard Anspach; and the three-wire system will be employed in the distribution of the current, which will be sold by meter. The Company are to "run" the station for two years after delivery, to the satisfaction of the municipal authorities.

Competition for Inventors and Scientific Writers.—*The Times* says that by the will of the Dr. Cesare Alessandro Bressa, a sum of money has been left to the Royal Academy of Sciences of Turin, so that from time to time a prize should be given for the best scientific work written, or the most important discovery made, during the preceding period of four years. It is now announced by the Academy that the last term of four years has closed, and that a new term, dating from Jan. 1, 1891, to Dec. 31, 1894, is in progress. Further, the Adademy gives notice that, whereas to the last competition only Italian authors and inventors were admitted, now scientific men and inventors of all nations may compete. The sum fixed for the prize, income-tax deducted, will be 10,416 frs. Those who desire to compete must declare their intention of doing so within the time above mentioned, by means of a letter addressed to the President of the Academy, and must send the work they offer for adjudication, which must be printed, as manuscripts are not considered.

The Hartley Fund.—It having been deemed advisable to close the trust created to administer the above fund, it will probably interest many of our readers if a brief statement is made as to the way in which the money contributed on the death of the late Mr. F. W. Hartley, for the benefit of his surviving daughters, has been disposed of. A circular sent to the subscribers in September, 1886, reminded them that the fund (which, in all, amounted to £1034 10s. 9d.) had been placed under a Committee of Management, consisting of Mr. Robert Harris, Mr. W. H. Bennett, Mr. H. J. Chaney, Mr. George Livesey, Mr. Charles Hunt, Mr. Robert Morton, Mr. W. Longworth, Mr. W. Sugg, Mr. Alfred Lass, and Mr. Walter King—the two first of whom have since died. The statement of accounts already in the hands of the subscribers showed that a sum of £753 15s. had been invested in Consols, in the names of Messrs. Harris, Morton, and Sugg, as Trustees; £93 9s. 6d. had been expended in providing a suitable house, business furniture, and stock-in-trade, whereby the three eldest daughters were established in business, which has since proved very fairly successful; incidental expenses, printing, and postages amounted to £11 8s. 6d., and there was a balance in the bank of £186 15s. 3d. This latter amount, together with the dividends on Consols, and a small portion of the principal, has since been used for the further education of the younger members of the family, paying the premium required to apprentice one of them, as well as to assist the elder ones in establishing their business. Now, however, as all the girls except the youngest are grown up and settling in life, it was thought best by the Committee to distribute the fund—the portion for the youngest daughter being re-invested in her name in Consols till she comes of age. This has been done, and the amount of £178 15s. 11d. is the portion for each daughter. In this closing reference to the matter, it is only right that allusion should be made to the great interest evinced by the late Mr. W. H. Bennett in the performance of his duties as Honorary Secretary of the fund, as upon him devolved the major part of the work entailed by its initiation and administration up to the time of his lamented death last year. The books and papers in regard to the Fund are left with Mr. King, and can be inspected by any subscriber wishing to see them.

TECHNICAL RECORD.

EXPERIMENTAL DETERMINATION OF THE HEAT GENERATED PER CANDLE POWER BY GAS AND OIL LAMPS.

A Paper read by Professor D. S. Jacobus, of Hoboken (N.Y.), before the American Society of Mechanical Engineers.

In the course of a general investigation, recently undertaken by the Department of Tests at Hoboken, to determine the relative cost of obtaining the average illumination afforded by gas and kerosene lamps in railroad service, it was proposed to ascertain the amount of heat generated per candle power with each kind of illuminant; and this element of the general problem was assigned to the writer.

The calculation of the theoretical heat of combustion of the gas and kerosene from their respective chemical analysis is, of course, one solution of such a problem; but it was desired to check the results of the calculation by a measurement of the heat after it had distributed itself to the air surrounding the lamp, and supporting the combustion under as nearly as possible the conditions of a lamp in railroad service. The determination of quantities of air flowing through any space, by the measurement of velocities with the best forms of anemometers, affords results so unsatisfactory that it was deemed necessary to devise some other method for such measurement. This having been, I believe, successfully accomplished in the present case, it is the object of this paper to describe the method, and also to place upon record, in detail, the measurements of candle power necessary to establish the average illumination obtainable from the best forms of kerosene lamps.

The general idea of the method employed to measure the total heat generated is as follows: The lamp was surrounded with an air-tight wooden chamber about 4 feet square, with a circular air-inlet pipe at the bottom, and another near the top. When steady action was established, the temperatures of the air entering and leaving the chamber were determined by thermometers located at a sufficient number of points in each of the air-pipes to establish a true average for the entering and exit currents. An anemometer was uniformly moved about the cross section of the inlet-pipe, and the candle power simultaneously determined by a photometer applied by the side of the chamber (see fig. 1, next page). The lamp was then removed from the chamber, and a steam coil substituted, as shown in fig. 2. The condensation of steam in this coil was adjusted so that the anemometer and thermometers gave practically the same readings as when the lamp was in the chamber. The total heat given by the lamp was then determined from the latent heat of the steam condensed; proper allowance for differences of radiation, effect, &c., being made, as explained below.

It is evident that by this method we avoid having to interpret the readings of the anemometer as absolute velocities. The only means of doing this is to calibrate the anemometer by moving it at uniform velocity through the air, as, for instance, by attaching it to the end of a radius arm rotating at uniform speed. The condition of the anemometer when so calibrated differs so much from those surrounding it, when located in the inlet-pipe, that in the present case the quantity of air differed 20 per cent., when thus determined, from the true amount as deduced from the heat of the condensed steam, by means of the observed temperatures of the entering and exit air.

The agreement between the heat determined by the condensed steam method and by analysis is as follows:—

Heat Generated in British Thermal Units.	Chemical Analysis.	Condensed Steam Method.
Per cubic foot of oil gas at 85° Fahr. .	1,280 ..	1,250
Total heat per pound of mineral seal kerosene oil, with Argand burner . .	19,000 ..	18,830
Total heat per pound of mineral seal kerosene oil, with double-wick flat-flame burner	19,000 ..	18,750
Total heat per hour per candle power in British thermal units { Oil gas .	130 ..	127
Total heat per hour per candle power in British thermal units { Kerosene	193 ..	191

The candle power measurements showed that the most improved form of Argand railroad lamp consumed the same amount of kerosene per candle power as the best form of flat-flame lamp, in which two wicks are used with an air supply between them; the combustion of the two wicks uniting so as to form a single flame. The maximum light which could be steadily maintained, with the attention available in railroad service, with the Argand flame, was 16 candles; and with the flat flame, 8 candles. The oil gas was burned in a four-flame Pintsch burner; affording, under the average condition of railroad service, a light of 32 candles.

The results of the experiments are given in detail in Tables I. and II. (next page).

Description of Apparatus Employed, and of the General Methods of Making the Tests.

The lamps tested were taken from cars in which they had been in active service. Each lamp was suspended from a section of a car roof. These sections were cut from a car that had been in service, and were covered with roofing tin in the usual way. Two varieties of oil-lamps were tested. One of these had Argand flames, and the other flat flames. The flat-flame lamp had two wicks per burner, between which a portion of the air for combustion was admitted. The gas was burned through a four-flame Pintsch burner.

TABLE I.—*Heat Generated by Gas and Oil Lamps.*

Class of Lamp.	Number of Tests.	Velocity of Air over Car Roof, in Miles per Hour.	Heat per Hour per 32 Candle Power, in B.T.U.		Total Heating Power per Cub. Foot of Gas or per Pound of Oil in B.T.U.
			Total.	Imparted to Air around the Lamps.*	
Gas . . .	9	0	4045	..	1,233
,, . . .	10	0	4084	..	1,261
,, . . .	4	0	..	3536	..
,, . . .	3	40	..	1847	..
Oil Arg. bur. .	12	0	6278	..	18,830
,, ,, .	11	0	5971	..	..
,, ,, .	6	0	5831†	3583	..
,, ,, .	5	40	..	1942	..
,, ,, .	7	40	..	2300	..
,, ,, .	21	40	..	2030	..
Oil, flat flame	28	0	..	..	18,750

* The arrangements of the currents of air in the testing-box should not be considered as a copy of the currents in a car. The results given in the table simply indicate that the ventilator carries away a great portion of the heat.

† This quantity is not determined by the direct method of measuring the total heat, but is calculated by measuring the heat leaving the ventilator, and adding it to that given up to the air about the lamp. The direct determinations only are employed in drawing conclusions.

TABLE II.—*Rate of Oil Consumption in Argand and Flat-Flame Lamps—Two Flames Burned in Each Test.*

Number of Test.	Duration of Test in Hours.	Class of Flame.	Oil burned per Hour in Pounds.	Candle Power Sum of Two Flames.	Oil per Hour per 32-Candle Power in Pounds.
12	4·5	Argand.	0·333	32·2	0·331
21	2·0	,,	0·344	33·5	0·329
23	5·0	Flat flame.	0·152	15·9	0·306

To make a complete heat measurement, the lamp is placed in the testing-box, as already described, and all data recorded. The lamp is then removed, and in its place is substituted a steam radiator. This is furnished with sufficient steam to heat the air the same amount and produce the same anemometer readings as were observed in the test of the lamp. The heat given up by the radiator will then be the same as the heat generated by the lamp, and may be measured by weighing the steam condensed by the radiator. The arrangement of the radiator coil is shown in fig. 2.

The radiator J is placed at an angle, so that the condensed steam will flow freely from it. The steam furnished to the radiator is superheated, in order that the total heat it contains may be accurately estimated. The Bunsen burner B is employed to heat the steam sufficiently to give the desired amount of superheating after passing through a throttling orifice at E. The amount of steam entering the radiator is controlled by means of the valve A. The gauge D gives the pressure of the steam entering the coil. C is used to assist in preserving a uniform rate of flow through the orifice E. F and G are thermometers inserted in mercury wells to measure the temperature of the superheated steam at the entrance, and of the water at the exit. The exit water is preserved at a constant height in the water-glass K by throttling at the valve L. In order to prevent loss by evaporation, the condensed steam is led through the rubber tube M under the surface of cold water, in which it is finally weighed. In some of the tests, the radiator would have been too large for the work if it had been completely filled with steam. In these tests a certain amount of air was left in the radiator, which reduced the rate of condensation to the desired amount.

To eliminate leakage in the testing-box shown in fig. 1, all the joints were carefully glued together. The doors were made a good fit, and after closing them soft putty was spread over the cracks around them. The cracks at the sides of the

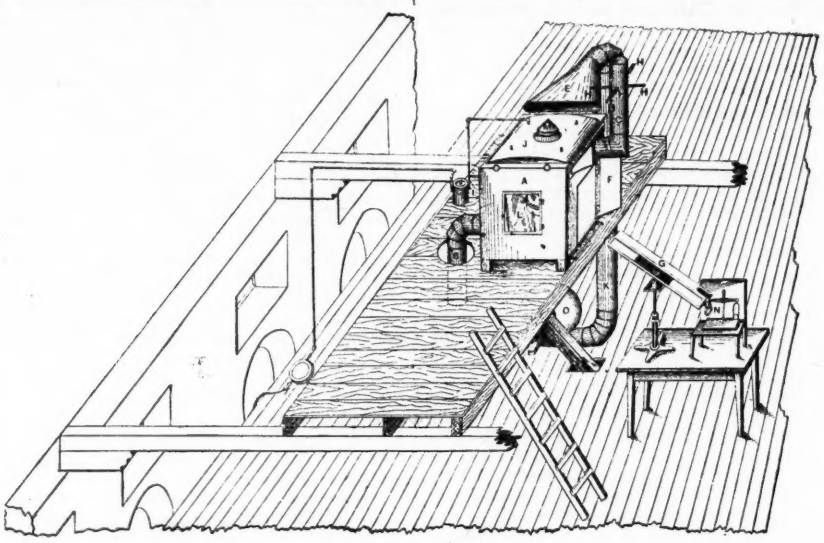


FIG. 1.

The general arrangement of the apparatus is shown above. A is a box about 4 feet square, in which the lamp to be tested is placed. The top of the car-roof section J, in all tests except those in which the total heat is measured, projects slightly above the top of the testing-box. L is a glass door through which the conditions of the lamp flames may be observed; and F is a door that is opened when the candle power is measured. In making heat measurements, the doors L and F are closed. The air then enters through the galvanized iron pipe B, which is 12 inches in diameter, and passes out through the lamp ventilator M and the pipe C, which is 10 inches in diameter. H are five thermometers used to measure the exit temperature. These are placed so that their bulbs are in various positions in the same cross section of the pipe. I is a meter for measuring the gas used by the gas-lamp. In tests where the effect of the velocity of the air over the top of the car is included, the blower D furnishes air through the 12-inch-pipe K to the nozzle E. The blower was made to run at such a speed that the velocity of the air over the ventilator M was 40 miles an hour. The candle power was measured by means of the photometer G. N is the candle-balance.

In the tests of the total heat developed by the lamp, four strips, one of which is marked O O in the figure, were removed, so that the air from the box had free access around the edges of the car-roof section, and a special cover, which was high enough to clear the ventilator M, was placed over the top of the testing-box. The pipe C was removed from the side of the testing-box, and placed on a flange fastened to the top of the special cover. In the tests for total heat, therefore, all the air that entered through the pipe B passed out through the pipe C. Anemometers were employed to measure the velocity of the air in the pipes B and C,

moveable pieces O O were covered with thick brown paper, pasted on with flour paste. The pipe C was thickly covered with felting. All the exposed portions of the apparatus shown in fig. 2 were covered with felting.

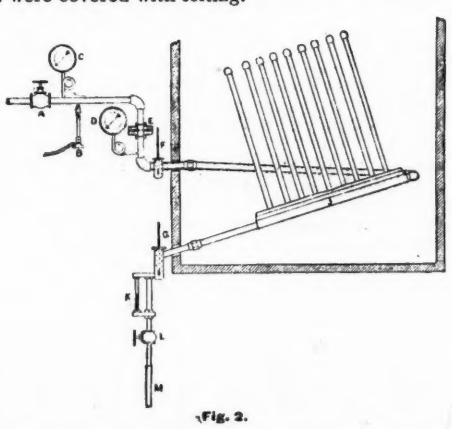


FIG. 2.

In a preliminary test, the joints at the sides of the moveable pieces were not covered with the strips of paper. Although the joints were well made, the pieces being fitted in place as accurately as possible, the leakage of air through them was found to seriously affect the readings. It was for this reason that every joint in the box in all the tests employed in deducing

the heat data were closed by either pasting paper over them or by means of soft putty.

The method just described is that employed in all the tests; but there are necessarily corrections to be made to allow for variations of the temperatures and anemometer readings in tests with the steam radiator in the box, with the corresponding ones in which the lamps were in the box. Where several lamp tests were made under nearly the same conditions, a single radiator test was made, and the proper corrections applied in reducing the corresponding heat for the lamp tests. The method of making these corrections and details of the experiments will be given later.

To measure the candle power at various angles under the lamp, a rotating photometer, devised by Dr. Geyer, was adopted. This is represented in fig. 3. A is the photometer, which is

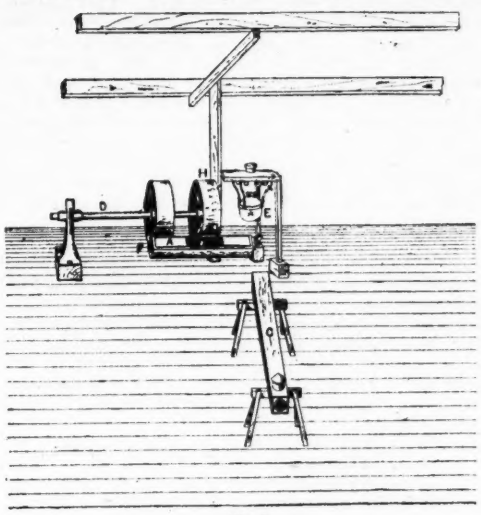


Fig. 3.

made to rotate about the shaft D. B is a mirror mounted at an angle of 45°. The lamp E is placed so that the flame centre is on the centre line of the shaft D. The candle power in a horizontal direction is first measured directly by means of a second photometer C; after which the photometer A is rotated so that it also measures the horizontal candle power. The difference in the readings gives the loss due to the mirror. After reading the horizontal candle power by means of the rotary photometer, the candle powers at the various angles under the lamp are measured. The desired angles are marked on the pulley H. The standard candles for the rotating photometer are placed on a support, fastened on a special piece that is held against the end of the photometer at F. They are lifted from the support in order to weigh them. The candles used in the photometer C remain on a pair of candle-balances. The results of the measurements by means of this photometer are given in Tables III., IV., V., and VI.

TABLE III.—*Candle Power at Various Angles (Gas-Lamp, Test No. 24).*

Time. P.M.	Candle Power Corrected for Mirror and Rate of Burning of Candle.						
	Horizontal.	15°	30°	45°	60°	75°	Vertical.
10.30	39·6	..	..	34·9	34·3	26·4	25·1
11.00	37·2	37·2	33·2	35·9	35·9	23·9	22·6
Midnight.							
12.00	36·1	36·1	33·4	..	..	..	..
12.25	37·7	37·7	32·5	33·8	35·1	26·0	26·0
Total . .	150·6	111·0	99·1	104·6	105·3	76·3	73·7
Average .	37·7	37·0	33·0	34·9	35·1	25·4	24·6

Average candle power for all positions below the horizontal plane. . . . . = 32·50
Ratio of average candle power to candle power at 45° = 0·93
Ratio of candle power in horizontal direction to candle power at 45° . . . . . = 1·08

In test No. 8, the relative candle power at 60° and 45° was found to be $\frac{\text{C. P. at } 60°}{\text{C. P. at } 45°} = \frac{31·4}{32·5} = 0·97$ (see Note), whereas in the above test the corresponding ratio is 1·01. The difference between these quantities is probably due to the fact that the lamp was placed in a slightly different position in regard to the photometer. The positions of the lamp are shown in fig. 4.

Note.—The details of this test are as follows:—
Candle power at 45°, taken over ¾-hour intervals—mean of five observations . . . . . = 32·4
Candle power at 60°, after shifting photometer—mean of seven observations . . . . . = 31·4
Candle power at 45°, photometer in original position—mean of five observations. . . . . = 32·6

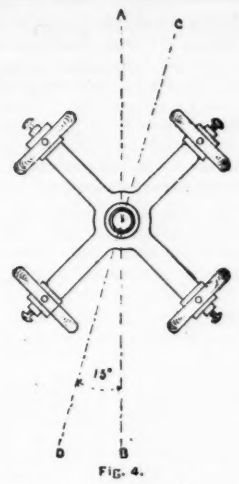


Fig. 4.

TABLE IV.—*Candle Power at Various Angles (Argand Oil-Lamp Test No. 26).*

Time. A.M.	Candle Power Corrected for Mirror and Rate of Burning of Candles.						
	Horizontal.	15°	30°	45°	60°	75°	Vertical.
3.00	23·1	18·9	18·9	16·8	10·5	4·9	7·0
3.50	18·2	16·8	15·4	12·6	8·4	4·2	5·6
4.20	19·6	16·8	15·4	11·2	8·4	3·5	5·6
Total. .	60·9	52·5	49·7	40·6	27·3	12·6	18·2
Average .	20·3	17·5	16·6	13·5	9·1	4·2	6·1

Average candle power for all positions below the horizontal plane. . . . . = 12·50
Ratio of average candle power to candle power at 45° . = 0·93
Ratio of candle power in horizontal direction to candle power at 45° . . . . . = 1·50

TABLE V.—*Candle Power at Various Angles (Argand Oil-Lamp, Test No. 31).*

Time. P.M.	Candle Power Corrected for Mirror and Rate of Burning of Candles.						
	Horizontal.	15°	30°	45°	60°	75°	Vertical.
9.25	26·0	24·7	20·6	19·2	9·6	4·1	6·2
10.30	24·5	24·5	21·9	16·8	9·0	4·5	6·4
10.55	25·5	25·5	22·8	18·1	9·4	4·7	6·0
Total. .	76·0	74·7	65·3	54·1	28·0	13·3	18·6
Average .	25·3	24·9	21·8	18·0	9·3	4·4	6·2

Average candle power for all positions below the horizontal plane. . . . . = 15·70
Ratio of average candle power to candle power at 45° . = 0·87
Ratio of candle power in horizontal position to candle power at 45° . . . . . = 1·41

Candle power at angles above the lamps: Horizontal, 25·5; 15° above equal, 24·1; 30° above equal, 20·1; 45° above equal, 5·4.

The candle power readings given in Tables IV. and V. are for one flame furnished with a white porcelain shade, as in car practice. To obtain the candle power of a lamp with two burners, multiply the results by two. A supplementary test was made on an Argand burner with a slightly larger spreader than those furnished with the car lamp, and having no shade. This test was made by measuring the candle power directly without the use of a mirror. The ratio of candle power at 60° and 45° was found to be 1·40.

TABLE VI.—*Candle Power at Various Angles (Flat-Flame Oil Lamp, Test No. 27).*

Time. A.M.	Candle Power Corrected for Mirror and Rate of Burning of Candles.						
	Horizontal.	15°	30°	45°	60°	75°	Vertical
4.45	11·0	11·7	11·7	8·3	6·2	4·1	5·5
5.09	11·0	11·0	10·4	8·3	4·8	4·5	4·8
5.15	10·4	10·4	9·7	7·8	4·8	4·8	5·5
Total	32·4	33·1	31·8	24·4	15·8	13·4	15·8
Average .	10·8	11·0	10·6	8·1	5·3	4·5	5·3

Average candle power for all positions below the horizontal plane . . . . . = 7·90
Ratio of average candle power to candle power at 45° . = 0·97
Ratio of candle power in horizontal direction to candle power at 45° . . . . . = 1·33

The flame was placed at an angle of 45° to the plane in which the candle power was measured.

In the tests of candle power by means of the rotating photometer, as given in Table III., the gas-lamp was mounted so that the illuminating power was measured in the plane A B (fig. 4). In a previous test (No. 8) to determine the relative candle power at the angles of 45° and 60° below the horizontal by shifting the photometer shown in fig. 1, and in all the tests in which the heat generated by the lamp was determined, the candle power was measured in the plane C D. Fig. 4 represents the positions of the gas-flames in looking downward on them.

Measurement of Candle Power.

A Bunsen photometer was employed. The standard candles were purchased from the American Meter Company. These were compared with a Sugg standard candle, and found to agree within 1 per cent. The following are details of the tests:—

TABLE VII.—*Comparison of Candle Power of Sugg Standard Candles and the Standard Candles (A and B), Am. Meter Co.*

	Time to Burn 10 Grains of Candle in Minutes and Seconds.		Ratio of Actual Intensity of American Meter Company's Candle Power to Unity.	Illuminating Power of Candles for Readings of Photometer Scales—Am. Meter Co. Candles taken as Standard.		Candle Power of Sugg Candle, Calculated from Rate of Burning.
	American Meter Company.	Sugg.		Actual.	Corrected for Ratio of Burning of Am. Meter Co. Candle.	
A	2.54	2.37	·862	1·10	·95	·96
	2.31	2.47	·993	0·90	·89	·90
	2.38½	2.47	·946	0·95	·90	·90
	2.42	2.42¾	·926	1·00	·93	·92
	2.34½	2.37½	·971	0·98	·96	·95
B	2.56½	2.40½	·850	1·10	·93	·93
	2.54	2.32	·862	1·14	·98	·99
	2.46	2.44½	·904	0·95	·86	·91
	2.39	2.24	·943	1·05	·99	1·04
	2.45	2.31	·909	1·08	·99	0·99
	2.41	2.28	·932	1·10	1·02	1·01
Average.		..	..	..	0·945	0·954

The candles therefore agreed with each other to within 1 per cent., which is less than the probable error in observation. Two flames were burned in each set of candles. The photometer scale was graduated for one candle, so that the readings should be multiplied by two to give the candle power developed in the test. This is not done, however, because the readings, as they stand, give the average candle power for the candle.

Special tests were made to determine the effect of a spark on the ends of the candle-wicks. These indicated that, if the spark is a small one, and does not alter the whiteness of the flame, the candle power, when corrected for the rate at which the wax is burned, is the same as for a candle in which the spark is completely removed. If the spark becomes large enough, however, to cause the flame to appear yellow, the candle power per grain of wax burned will be less than that given by a candle with no spark. The amount of falling off of illuminating power due to this cause may be as high as 15 per cent.

In the measurements of candle power taken during the tests for the heat given off by the lamps, the photometer was set at an angle of 45°. This was found to be about an average of the power measured below a horizontal plane passing through the flame centre (see Tables III. to VI.). In the heat tests, therefore, the candles were at an angle of 45° with the centre line of the photometer. In placing the candles in their positions, the measurements were taken from the centre of the flames.

(*To be continued.*)

Business Changes.—Messrs. Warner, Walduck, and Co., of Gresham House, Old Broad Street, have admitted into partnership Mr. W. Bell and Mr. F. G. Barrett, who have for many years taken an active part in the business. Owing to the continued illness of Mr. J. R. Young, the firm of Messrs. Young, Dance, and Co., of Newcastle-on-Tyne, has been dissolved by mutual consent as from Oct. 31 last; and the business will be continued by Mr. T. W. Dance, under the style of Messrs. Thos. W. Dance and Sons.

Projected Exhibition of Coke-Stoves in Brussels.—The Belgian Association of Gas Managers have decided to hold an exhibition of stoves and other appliances in which coke can be utilized for domestic or industrial purposes; the object being to bring the public to an appreciation of its advantages as a fuel. The 15th of March is the latest date for sending in samples; but their destination has yet to be definitely settled. A Jury, of which M. Depaire, Professor of Chemistry at the Brussels University, is President, and M. Boscheron, President of the Belgian Association, is Secretary, has been nominated; and it is intended to distribute a sum of 10,000 frs. in premiums to the best makers. These will be paid only so soon as a regular sale shall have been established in Belgium for the premiated appliances, at the prices indicated by their makers. Nine classes of stoves, &c., are specified, in each of which special awards may be made. The Association will bear the expenses of the exhibition. The Secretary (M. Boscheron) will be pleased to furnish particulars in regard to the project, on application being made to him at No. 111, Boulevard Anspach, Brussels.

THE SPONTANEOUS COMBUSTION OF COAL.

The above subject was chosen by Professor CLOWES, of the University College, Nottingham, for the first of the third series of lectures on scientific matters connected with mining, arranged by the Nottinghamshire and Derbyshire Technical Education Committee. It was delivered in the Lecture Theatre of the College, and was accompanied by experiments. We give below he principal portions of the lecture.

When the volume of any gas is reduced by pressure, heat is evolved; and the compression of oxygen gas mingled with oil vapour or spray is capable of igniting and exploding the mixture. Solid bodies possess in varying degrees the power of attracting and condensing gases upon their surface. This condensation, which is equivalent to compression, produces heat. The heat is imparted to the solid; but the temperature of the solid is seldom raised considerably by this means. If, however, the solid substance is wholly or partly combustible, and can unite with oxygen, thus condensed from the air, additional heat may be produced by the union. The temperature of the combustible matter may thus reach the igniting-point, and true combustion may set in. Since the condensation of gas is entirely a surface action, the increase of surface caused by powdering the substance, or making it porous, increases the amount of the gas condensed.

Certain kinds of coal, more especially when they are in the condition of slack or dust, have long been known to possess the power of kindling spontaneously. Coal is usually a very complex substance; consisting partly of combustible, and partly of incombustible or mineral matter. The incombustible matter does not now concern us; but among the combustible substances are carbon, various hydrocarbons (including pitch and bitumen) and "brasses" or pyrites. We will consider these separately as regards their power of causing spontaneous heating of the coal.

Carbon is the main constituent of all good coal. This substance, in its most compact forms of diamond or black lead, possesses extremely small power of attracting and condensing gases. But in its most porous form of wood charcoal, it can absorb nearly ten times its volume of oxygen from the air, and about 100 times its volume of certain other gases. In newly-won coal, the carbon is much less porous, and can absorb, according to its degree of porosity, from about 1½ to 3 times its volume of oxygen from the air. Although this absorption causes but little heating in itself, further heating is soon caused by the oxygen thus absorbed slowly burning the carbon. This slow burning warms the coal; and if the dissipation of the heat is hindered, and particularly if additional heat is imparted from any source, the temperature of the coal may rise considerably by the mutual action set up between the carbon it contains and the oxygen of the air. The more porous wood charcoal, if produced in closed vessels, will always fire in the air if it is turned out when freshly cooled. The heating effect is much reduced by wetting the coal or charcoal with water, which at once lessens the surface exposed to the air, and tends to cool as well.

With regard to hydrocarbons, bituminous matter, and pitch, experience has shown that it is the bituminous coals which fire most readily when exposed to air. Bituminous matter is found to undergo much more rapid spontaneous burning than carbon; and the oxygen absorbed by the coal is accordingly much more rapidly converted into carbonic acid when the coal is bituminous than when anthracitic or carbonaceous. Bituminous small coal, if heaped together in a dry state, and in such a way as to allow free circulation of air, may slowly kindle itself. The rate of heating is undoubtedly much increased if the coal is warm.

Pyrites attracts attention as brassy flakes seen on the surface produced by fracture of the coal. But it is also present as black powder scattered through the substance of the coal, and as beds several inches thick in the seam. The quantity present in the coal varies widely; but pyrites is rarely absent. It shows its presence, if in any large quantity, by producing a brown ash, and emitting the smell of brimstone when the coal is burnt. Dr. Percy insisted that it was wrong to attribute the spontaneous kindling of coal to the presence of pyrites; and his opinion has been supported by recent investigations. Pyrites slowly oxidizes in moist air; but that the heat produced by this change could never raise the coal to its kindling-point is shown by the fact that the coals most prone to spontaneous combustion contain only from 0·8 to 1·25 per cent. of "brasses." Further, the kindling-point of various kinds of coal are—

Cannel coal	698° Fahr.
Hartlepool coal	766° ,,
Lignite	842° ,,
Welsh steam coal	870° ,,

These temperatures could never be attained by the oxidation of the "brasses" alone. Further, coal which is undergoing spontaneous heating is found to be constantly losing in weight; showing that this effect is due to slow burning of carbon or bitumen. If the heating were due to oxidation of the pyrites, the coal would necessarily gain in weight. On the other hand, the change undergone by the pyrites may indirectly promote the kindling of the coal, by depositing in it sulphur of low

kindling-point, and by cracking up the coal, and thus exposing a larger surface to the air.

The lecturer next passed on to consider the causes of the spontaneous firing of cargoes of coal on shipboard, and the means to be taken to counteract them. In this connection he referred to the investigations of Professor Vivian B. Lewes on the subject, as described by him in papers read before several societies, and noticed in our columns from time to time, and gave a short account of his conclusions. It had been found, he said, that the rapidity and amount of heating which occurs in a cargo of coal varies with several conditions. As the tonnage of the cargo increased, the kind of coal and other general conditions remaining the same, the tendency to heating and firing of the coal increased; and the longer the voyage, the greater became the liability to the ignition of the cargo. He cited facts and figures in support of these statements, and then proceeded as follows:—

The particular kind of coal seems to have some influence on the risk of spontaneous firing. Thus it is acknowledged that east-coast coal is a safer ship cargo than west-coast coal. It is probable, however, that the condition of the coal is the chief determining cause of this difference, and the condition may in some measure depend upon the kind or quality of the coal. By the "condition" is meant the state of the coal—whether it is in lumps or broken into small coal or dust. Undoubtedly the coal which has the least tendency to heat becomes much more dangerous when it is broken up. Hence the danger will be heightened by the increased brittleness of the coal, and by roughness in handling it during loading. The presence of "brasses" in large proportion only indirectly adds to the danger, when the coal is moist, in the way already explained. A much more important characteristic of different kinds of coal, in determining their tendency to heat, is their absorptive power; and this may be conveniently measured by finding the loss of weight which the air-dried coal undergoes at steam heat. This loss of weight measures the absorptive power of the dry coal for moisture, since it is the moisture which is expelled by raising the temperature of the coal to steam heat. The absorptive power for moisture apparently measures the absorptive power for gases also.

The following table seems to indicate that the tendency to spontaneous firing shown by different kinds of coal is related to the amount of moisture the dry coal is capable of absorbing, and is in no way whatever related to the quantity of pyrites that may be present in the coal:—

Liability to Spontaneous Firing.	Percentage of Pyrites Present.	Percentage of Moisture Present.
Very slight	1·13	2·54
	1·01 to 3·04	2·75
	1·51	3·90
Medium	1·20	4·50
	1·08	4·55
	1·15	4·75
Great	1·12	4·85
	0·83	5·30
	0·84	5·52
	1·00	9·01

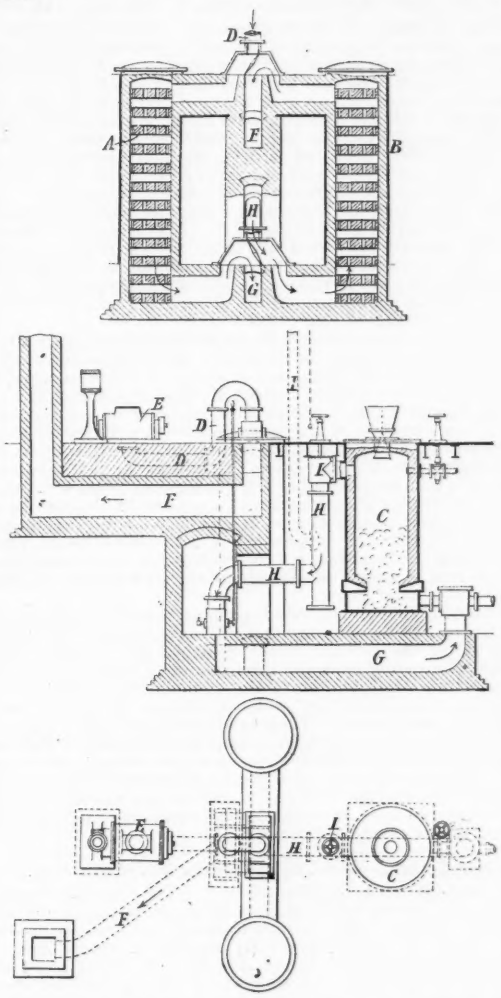
With respect to the ventilation of a cargo of coal, with the idea of removing inflammable gases, the lecturer pointed out that this might itself be a source of danger. Four colliers were loaded with coal from the same seam, and by means of the same tips. Three were ventilated, and proceeded on their journey to Aden. None of these reached the port; being all lost by the spontaneous firing of their cargoes. The fourth was not ventilated; and it reached Bombay in safety. There was little doubt that the air enclosed in the cargo was insufficient to give rise to dangerous heating, and that the introduction of additional air by ventilation enabled the heating to occur by supplying the requisite air. Coal which had heated in the air and begun to cool again was safe from risk of further heating; hence storing coal in the air for a sufficient length of time before loading was a precaution which would be calculated to ensure the safety of the cargo.

The following practical conclusions were submitted as deducible from the facts presented: (1) The danger of spontaneous firing of coal in large lumps is very slight; it is much greater with small coal, and greater still with dust. The increase of danger is due to the larger extent of surface exposed to the air in proportion to the mass of the coal. (2) Air-dried coal which contains more than 3 per cent. of moisture is dangerous; if it contain less, the danger diminishes as the amount of moisture is less. The moisture present in the coal is a measure of its absorptive power for air; and the most absorptive coal is the most dangerous. (3) The danger is somewhat increased by the presence of pyrites, in large quantity; not because this heats the coal to any appreciable extent, but because, when moistened, it swells—breaking up the coal, and exposing a larger surface to the air. (4) Newly-won coal should be shielded from the air as much as possible, to prevent the chance of rapid heating; and for the same reason it is best not to stack it in large heaps, since these retain the heat. Ventilation of the coal often adds greatly to the risk of spontaneous firing. (5) All external sources of heat, such as steam-pipes, boilers, and hot flues in the neighbourhood of the coal, add very greatly to the risk of firing. Spontaneous heating becomes vastly more rapid when it is thus assisted by outside sources of heat.

REGISTER OF PATENTS.

Water Gas Manufacture.—Fox, S., of Leeds. No. 1804; Jan. 29, 1892.

This invention relates to plant for "the manufacture or production of water gas, by using an air blast heated to a high temperature by passing through a regenerator previously heated by hot gases escaping from the water-gas generator, for raising the fuel in the water-gas generator to a suitable degree of incandescence to produce water gas, by contact therewith of steam, whereby the fuel is raised to the desired state of incandescence more rapidly, so that a larger quantity of water gas can be produced in a given time, than by the employment of a cold-air blast."



The illustrations show a sectional elevation, a cross section, and a sectional plan of apparatus for the production of water gas according to this invention.

A and B are air-regenerators, containing brickwork arranged chequer wise; and C is the water-gas generator. The upper end of each regenerator is in communication with a reversing-valve, by means of which the upper end of the regenerator can at will be placed in connection with a cold air supply-pipe D, into which air is forced by a blower E, or with a chimney by way of a flue F. The lower end of each regenerator is in communication with another valve-box, provided with a reversing-valve, by means of which the lower end of the regenerator can at will be placed either in connection with a hot-air passage G, leading to the lower end of C, and controlled by a valve, or with a pipe or flue H in connection with the upper end of the generator. This valve may advantageously be a reversible water-cooled valve of ordinary construction, and so made that in one position it will permit heated air to flow into the bottom of the generator, and in its reversed position will enable the water gas to flow from the bottom of the generator into the gas-pipe. The upper reversing-valve is provided with a hand-lever and with an arm connected to a corresponding arm on the lower reversing-valve. I is an auxiliary exit-pipe, connected with the pipe H, and provided with a valve.

The operation of the apparatus is as follows: Assuming the valves to be in the positions illustrated in the cross section, and that the regenerator A has been previously heated by the passage through it of heated gases from the generator C, then the blower E being in action, cold air will flow downward through A, wherein it will become highly heated, and will thence flow, as indicated by the arrows, to the lower end of the generator C, the fuel in which will consequently be raised to a state of incandescence. Heated gases, produced by the action of the heated air-blast on the fuel, will simultaneously pass through H to the regenerator B, through which they will ascend, heating the brickwork therein, and finally escaping from the top to the chimney, as indicated by the arrows. After a short time—say, about twenty minutes—the positions of the valves are reversed, so that the cold air will now flow downward through the now heated regenerator B to the generator, the

heated gases from which will flow upward through the partially cooled regenerator A, and thence to the chimney. These operations are repeated until the fuel in the gas-generator is raised to a suitable degree of incandescence, when the supply of heated air is stopped, the lower valve reversed, and steam is introduced into the top of the generator, wherein it is decomposed by contact with the incandescent fuel—the resulting water gas being led away for use. During this time, a valve I on the pipe H is kept closed, to prevent water gas escaping through the pipe. After a time the supply of steam is cut off, and the heated air-blast again admitted to the bottom of the generator; these operations being repeated from time to time, as well understood.

Gas-Engines.—Abel, C. D.; communicated from the Gas Motoren Fabrik Deutz, of Köln-Deutz, Germany. No. 2728; Feb. 11, 1892.

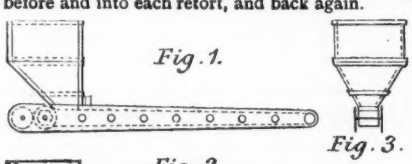
In their specification, the patentees say: For regulating the speed of four-stroke-cycle gas-engines, instead of drawing in cold air, the method is employed with advantage of drawing back into the cylinder the hot combustion gases of the previous explosion by the suction out-stroke of the piston, when one or more explosive charges are omitted or reduced in volume in consequence of the engine running too fast. By this means, the cylinder is prevented from becoming cooled; and the vaporization of the liquid particles, when oil is being used, is facilitated, or the detrimental condensation of such oil vapour on the cooled sides of the cylinder is prevented. If the engine is regulated by discontinuing the explosive charges for a time, the combustion gases have to be drawn into the cylinder during the entire outstroke. The regulation can, however, be effected in a more uniform manner, by varying the volume of the explosive charges introduced, without intercepting them altogether; and thus, to a certain extent, the power produced is proportioned at each stroke to the power taken off from the engine during such stroke.

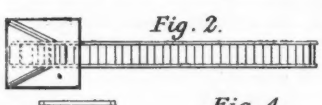
This is effected according to the present invention in such a manner that, during a certain part of the suction-stroke (the extent of which is regulated by a governor), the hot products of the previous explosion are drawn into the cylinder through the discharge-valve, after which, on the closing of the discharge-valve, explosive mixture is drawn in during the remainder of the suction-stroke through the inlet-valve of the cylinder. The charge of the cylinder will consequently be so constituted under these circumstances that against the piston there will be situated a variable quantity of hot combustion gases, while the rear end of the cylinder will be filled with a greater or less quantity of explosive mixture. As the charge thus drawn in is always at atmospheric pressure, the degree of compression of such charge by the following compression stroke will always be constant; so that, notwithstanding the existence of a more or less reduced explosive charge, reliable ignition will always be insured.

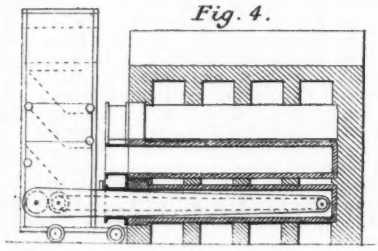
In carrying out this method of operating, there is combined with the ordinary cam on the way-shaft that effects the opening of the discharge-valve during the expelling stroke, a second cam, having a variable "dwell" for acting upon the discharge-valve during a part of the suction-stroke; and a third cam, also with variable "dwell," for acting upon the inlet-valve for the explosive mixture during the remaining part of the suction-stroke. These second and third cams are so arranged and controlled by a governor that, according as the speed of the engine rises or falls above or below the normal, the second cam is made to hold the discharge-valve open during a greater or less part of the suction-stroke, and the third cam is made to open the inlet-valve at the moment when the second cam allows the discharge-valve to close, and to keep it open till the end of the stroke.

Charging Retorts.—Grein, F., of Cologne. No. 16,750; Sept. 19, 1892.

In his specification, the patentee says: "The charging of gas-retorts has till now been done by hand, with shovel or trough, or mechani cally by machines. Most of such machines are, however, constructed with a sort of trough which (1) requires a pretty complicated machinery for moving backwards and forwards, lifting and lowering, especially as the trough in every position must be kept in balance by counter-weight; (2) contains the charge for only one retort." This invention consists of a particularly constructed tank terminating below into a sideways-opened funnel; and of a transporter (either endless chain or band or transport-spiral) placed under the tank. This tank holds enough coal for several retorts at the same time; and the transporter conveys to each retort the required quantity of coals. The tank is fixed to the transporter; and the whole, placed in a moveable frame, is raised or lowered by crane or other lifting appliance, so as to suit the different heights of the retorts. The frame is so constructed as either to move on wheels on the ground, or at the top of the furnace on rails or beams; and it can be carried by hand or machinery in order to bring it before and into each retort, and back again.







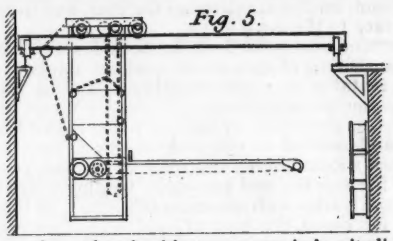


Fig. 1 shows the coal-tank with transporter in longitudinal section; fig. 2, in upper view; and fig. 3, in elevation. Here the transporter is an endless band constructed of sheet-iron links, connected by hinges and supported by rollers. These rollers are, however, not indispensable, says the patentee. The transporter can also be formed by an endless band made of wire or asbestos network, or be a transport-spiral.

Fig. 4 shows the apparatus in its moveable frame, which runs below on wheels. The transporter is to its whole length pushed into the retort, and is thus set in action.

Fig. 5 shows the apparatus in a frame running above, on beams, and entirely withdrawn from the retort. Here the bridge-boards of the transporter are of angle-iron; while in the other figures they are supposed to be of sheet plates.

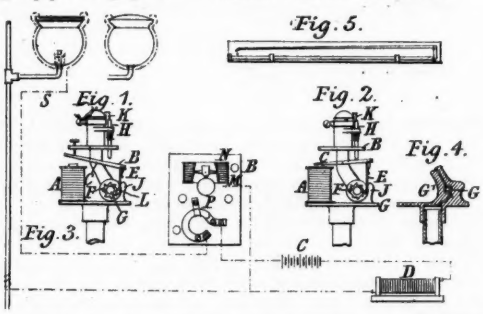
If through retorts are used, the transporter pushes out the coke when entering into the retort.

Gas-Making Machine.—Allison, H. J.; communicated from F. W. Beardsley, of Bayonne, U.S.A. No. 18,703; Oct. 19, 1892.

This is an arrangement of portable apparatus, with mechanical appliances for forcing air through hydrocarbon liquids, for the purpose of forming lighting gas—the main objects being to provide means for conveniently recharging the machine, drawing off the solution, preventing the escape of the hydrocarbon liquid from over-pressure, and freeing the service-pipe from condensed liquid without permitting the escape of gas.

Lighting and Extinguishing Gas-Lamps, and Automatically Indicating whether the Gas is Alight or Extinguished.—Orling, A., of Stockholm. No. 19,172; Oct. 25, 1892.

This electric lighting and extinguishing apparatus for gas-lamps is so arranged that the contact which causes the spark serving to light the gas is made only when the gas is turned on—a contact-maker secured above the flame, and protecting the ceiling, causing a thermo-electroscope situated at any desired place to indicate whether the gas is alight or extinguished. Fig. 1 shows a gas-burner with the arrangement applied thereto; the parts being in the position they occupy when the electric current is interrupted. Fig. 2 shows the current closed. Fig. 3 is a diagrammatic combination, showing a gas-burner on the circuit S, attached to the electroscope B, the battery C, and the induction-coil D. Fig. 4 is a vertical section of the gas-cock, with part of the gas-pipe. Fig. 5 is an elevation of the contact-maker.



The apparatus consists of two electro-magnets A, to the armature of which is pivoted a pawl E actuated by a spring and engaging in a ratchet-wheel F fixed on the gas-cock G. The cock-plug is perforated in two rectangular directions, so as to form passages; and the ratchet-wheel is provided with eight teeth, so that the cock, when turned to the extent of one tooth at a time is alternately opened and closed. Close to the slit of the burner is a vertical bar H, which can be easily displaced longitudinally. It is kept pressed down by a spiral spring, so that its top part (which is bent at an angle) rests upon an insulated pin K, with which the coils of the electro-magnets are connected. The length of the bar is such that it can be raised by the armature when the latter is moved by the electro-magnets. Further, every alternate tooth of the ratchet-wheel is deeper than the other teeth, whereby the pawl E, when being raised, approaches and recedes alternately towards and away from the centre of the cock. In the former case, when the gas is lighted, the pawl (having a shoulder L on its back) moves free of a stop-pin J; while in the latter case the pin J prevents the pawl from being raised, and in this way the armature is prevented from moving sufficiently to lift the bar. In the former case, there will thus be short interruptions of the current. The armature does not move back (before the current is again closed by the lowering of the bar) far enough to cause the pawl to enter the following tooth of the ratchet-wheel; and consequently the cock is never turned more than one tooth each time the knob is pressed. Owing to the short interruptions of the current, it is thus possible, by means of a suitable electric signalling apparatus, to indicate, by sound at the pressure-knob, whether the gas is lighted or extinguished. When the knob is pushed, the electric circuit is closed; and the lighting apparatus is thus actuated in such a way that a spark is emitted from between the points H and K so as to light the gas. The gas-pipe forms part of the circuit.

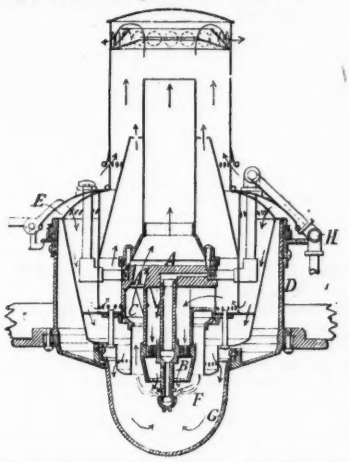
The thermo-electroscope (fig. 3) consists of induction-coils M, a permanent magnetic needle N, suspended upon a pivot O, and a

pendulum-shaped hand P connected with the magnetic needle, the two halves of which are of different colours.

Above the burner is placed the contact-maker shown in fig. 6. It consists of a bent lever, against the shorter arm of which rests one end of a bar which with its other end abuts against a stop. The bar, consisting of a material susceptible of expansion under the influence of heat, is placed above the burner, so as to be heated by the flame. When the bar is lengthened in this way, it causes the bent lever to move upon its pivot, so that its longer arm encounters the pin, whereby contact is made, and the thermo-electroscope introduced into the circuit, and connected with an electric battery, is deflected, and indicates that the gas is alight. A spring holds the shorter arm of the bent lever against the bar. The whole is fixed upon a plate secured across the burner in the same way as the corona or consumer.

Regenerative Gas-Lamps.—The Lamp Manufacturing Company and I. J. Collins, of Leonard Street, City Road, E.C. No. 19,337; Oct. 27, 1892.

As shown in the accompanying illustration, this lamp consists (so far as its central part is concerned) of a block A, having a hole bored to its centre to form a communication from the gas-supply pipe—a pipe leading down to a lower flanged piece B, from which a tubular passage leads down to the burner itself. The flange of B is pierced with holes, which form communication from a space above to a space below it. There are three or more horizontal triangular passages into the upper space from the surrounding casing; and between these, there are a corresponding number of vertical passages from a space C to a space above, which forms the base of the chimney. The burner is in the form of a metal cup, having in its upper face a groove, in which is embedded a perforated ring of steatite. The burner may, however, consist of a cup of steatite, or such like material, having two tiers of lateral perforations separated by a projecting flange. As, however, such a cup is liable to crack and break, an inner burner of metal is provided, which can operate as a burner in case the outer burner breaks away. The chimney may be simply a tube when the lamp is used in a room or other sheltered position; but when it is exposed to air-currents (as in a railway carriage), it is shielded by an outer casing, terminating in a guard at the top of the form shown.



The casing D terminates in a flange, as indicated, or else rests flange fixed to the ceiling of the carriage. The glass globe G may be of comparatively small size, suspended from a reflecting ring, as shown. While the parts D and G remain fixed, all the rest of the lamp—including the chimney, wind-guards, and shields for the air-passages—can be turned on a hinge H coinciding with the joint of the gas-pipe, so as to give access to the interior. When it is turned down for use, it rests on a ring of caoutchouc or other elastic packing material, secured by a catch.

The air for supplying the flame enters by perforations E under a guard; and on descending, part passes through holes allowing it to escape at [the top along with the products of combustion, with which also mix other currents of air entering by shielded holes. The products of combustion ascend through an annular passage to the space C, and thence through vertical passages to the chimney. By these products, all the metal forming the passages for the entering air is highly heated; and thus the air arrives at the flame at such a temperature that there is complete combustion of the gas, and consequently great brilliancy of light produced.

Water Supply System or Apparatus.—Leedy, J. K., of Shenandoah, Vir., U.S.A. No. 19,838; Nov. 3, 1892.

This invention relates to improvements upon the "syphonic water-distributing apparatus" covered by the patentee's United States patent No. 413,194, granted Oct. 22, 1889, wherein the distributing-main is arranged to syphon the water over any elevations and depressions that may intervene between the source of supply and the outlet—both ends of the distributing-main being sealed in water, so as to prevent ingress of air; the syphonic arrangement serving to cause the water to flow continuously through the main, no matter what may be the depression between the source and outlet points.

APPLICATIONS FOR LETTERS PATENT.

23,174.—Michell, M., "The 'Justita' attachment for use in gas cooking-stoves." Dec. 16.
23,182.—Tobey, H. A., and Yaryan, H. T., "Gas-meters." Dec. 16.
23,268.—Robertson, A. W. and J., "Effecting the rapid and economical transhipment of coal, coke, and other materials." Dec. 17.
23,281.—Mudd, T., "Condensers." Dec. 17.
23,303.—Slaytor, J., "Atmospheric gas-burners." Dec. 17.
23,323.—Knight, J. H., "Improvements in oil and gas engines." Dec. 19.
23,354.—Holmes, T., and Williams, R., "Pipe joint or coupling." Dec. 19.
23,355.—Symington, H., "Pipe-couplings." Dec. 19.
23,419.—Gray, J., "Manufacture of gas." Dec. 20.
23,436.—Atkinson, W. B., "Adjustable enamelled iron or other metal plates for interior of gas cooking-stoves." Dec. 20.
23,498.—Lake, H. H., "Generation of gas." A communication from A. Kimber. Dec. 20.
23,522.—Holbein, A. H., "System of lighting and heating." Dec. 21.
23,547.—South, W. A., "Increasing the flame and brilliancy of a gas or oil lamp." Dec. 21.
23,577.—Weymersch, H., "Production of a new material for use in obtaining oxygen from atmospheric air." Dec. 21.
23,657.—Friedl, B., "Gas-lamp with incandescent light." Dec. 22.
23,696.—Clerk, D., and Lanchester, F. W., "Gas and like engines." Dec. 23.
23,713.—Sepulchre, L., "Lighting apparatus burning mineral oil to be used in the open air." Dec. 23.
23,765.—Birchall, F. G., "Generating and consuming gas from hydrocarbon or other oil." Dec. 24.
23,780.—May, J., "Checking leakage of water, gas, steam, and the like from pipes." Dec. 24.
23,827.—Blom, D. J., "Gas motors." Dec. 24.
23,834.—Edwards, E., "Gas-stoves." A communication from A. Toussaint. Dec. 24.
23,876.—Arndt, M., "Ascertaining the volume of a particular gas in a gaseous mixture, and the weight of gases." Dec. 27.
23,921.—Morand, E., "Expansion in water-pipes, to prevent them from bursting by frost." Dec. 27.
23,924.—Thorp, T., Marsh, T. G., and Haynes, J., "Prepayment mechanism of gas-meters." Dec. 28.
24,065.—Best, D., "Gas-engines and motors propelled thereby." Dec. 30.
24,076.—Thomas, J., "Gas burners and lamps." Dec. 30.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by correspondents.*]

The Inventor of the Regenerative Burner.

Sir,—In reply to your correspondent "Owen Merriman" [whose letter was given in the Journal for Dec. 27 last, p. 1121], allow me to place on record the following facts:—

(1) The regenerative lamp figured in my "Experimental Researches" (p. 549) was constructed by me, at Manchester, early in the year 1853, and was exhibited in the theatre of the Royal Institution, at a lecture delivered by me on Friday, May 20, 1853. The lecture was mainly on the so-called "hydrocarbon" process of manufacturing gas, which I had just previously submitted to exhaustive investigation. The description of this process, which was extensively illustrated by models and diagrams, left me no time for reference to the lamp and other matters—the Royal Institution rule restricting Friday evening discourses to an hour being very stringent. In the published report of my lecture (Proc. R. I., Vol. I., p. 325), I refer to this in the following words: "There are yet several other points of an *economical* and sanitary nature connected with the use of artificial light; but time does not permit of their discussion." From this date onwards for 15 years the lamp was regularly used in my study until it was superseded by a paraffin-oil lamp. The exact gain in light was determined in 1854; hence the date in my "Experimental Researches."

(2) The first publication of my invention was in an article written by me in the seventh edition of Ure's "Dictionary of Arts," which appeared, I believe, in 1860, although the article was probably written a year or two earlier. The woodcut in that article was taken from a drawing made by myself.

(3) I first became acquainted with the late Rev. W. R. Bowditch in November, 1860, when he personally requested me to investigate his patent process for the removal of sulphur from coal gas; and this is the only investigation I ever made for him. It is therefore scarcely necessary to say that I never experimented with his lamp, or tested or experimented with any lamp at the instance of Mr. Bowditch at any time; and I now learn for the first time that he published such a statement. In fact, until I read your correspondent's letter, I was quite unaware that the credit of the invention was attributed to Mr. Bowditch.

I trust that these data sufficiently answer your correspondent's question "Which is it?" and justify the statement of Professor Lewes in his recent Cantor Lecture.

E. Frankland.

The Yews, Reigate, Dec. 31, 1892.

[This letter arrived too late for last week's issue.—Ed. J. G. L.]

Mr. Pease's Trials of Wind Action on Model Holders.

Sir,—I will point out the fact that (with the exception that, instead of making paper shells, I used exceedingly thin tin plate in their construction) I carried out exactly similiar experiments with shell models more than two years ago, the particulars and results of which were reported in the Journal. I found that a direct pressure of over 600 lbs. to the square foot, as usually calculated, was necessary before any permanent set from the perpendicular could be obtained, when the base alone was gripped in the spiral guides.

I will also point out that, as the wind pressure is a distributed force, it more nearly approaches the natural conditions to make the band communicating this pressure to the model of the full width of the height of the structure. If this be done, it will be found that several results will come out somewhat differently; for, although a strain applied half way up is a direct equivalent of the same equally distributed, provided the structure is sufficiently rigid to transmit the

forces at right angles, it only partially so acts in the case of a very elastic body, like the one described by Mr. Pease.

All the same, the more experiments are made the better, in the interest of true science; and when my early efforts become repeatedly tested, and consequently corroborated, the most sceptical will be justified in accepting, as completely verified, the mechanical position I have taken up in this matter.

W. GADD.

Manchester, Jan. 6, 1893.

Purification.

SIR,—Mr. V. H. Veley's contribution to the discussion on "Purification" does little or nothing to settle those points which have been previously under consideration. In his letter he says: "Hydrogen sulphide reacts with calcium hydrate to form calcium sulphide, the substance represented by the formula CaS. But this was found to be inert towards carbon disulphide." This bald and one-sided statement will mean one thing to one class of readers, but something else to another class.

Things were differently expressed by Mr. Veley in his paper read before the Chemical Society in 1885. He then wrote: "Lime, over which coal gas containing hydrogen sulphide has been passed—technically known as 'foul lime'—is a well-known absorbent of carbon disulphide." Also, "*perfectly dry calcium sulphide is not the absorbent of carbon disulphide.*" Near the end of the paper, however, we find the following: "Dry calcium sulphide does not, but moist calcium sulphide does, absorb carbon disulphide."

Most gas managers will also know that perfectly dry lime does not absorb carbonic acid, but that moist hydrated lime does. In a similar way, moist calcium sulphide absorbs carbon disulphide from coal gas; and this is of much more importance to those who have crude coal gas to purify than the information about the negative properties of *perfectly dry* calcium sulphide—a substance rarely or never found on gas-works. What a perfectly dry sulphide box will do, if it were possible to form one, has never been considered in the series of letters to which Mr. Veley has had his attention called.

In the paper referred to, read in 1885, Mr. Veley stated that he was "continuing his investigations regarding the effective value of calcium sulphide for the removal of carbon disulphide, with especial reference to the purification of coal gas." Perhaps Mr. Veley will now favour your readers with some of the results of these investigations, which, I think, have never been made public in any way during the last seven years, but which, if now given, might save others from going unnecessarily over somewhat similar ground.

THOS. STENHOUSE.

Rochdale, Jan. 6, 1893.

SIR,—Every gas engineer who is interested in the question of sulphur purification will read with pleasure Mr. Veley's intimation that we may anticipate further investigations by him. I would, however, strongly urge that, before final conclusions are drawn, experiments be made in which crude gas is used.

As regards Mr. Stenhouse, in London it is found necessary to use cannel and oil to increase the illuminating power. He, however, seems to suggest that at Rochdale it is found more economical to use oxygen for the purpose—a statement of great interest.

C. C. CARPENTER.

Vauxhall, Jan. 9, 1893.

Eveson's Compound for Preventing Stopped Ascension-Pipes.—We have received from Mr. Eveson another letter on the above subject, in which he acknowledges the courtesy of Mr. Hack in clearly pointing out, in his letter to the JOURNAL for the 20th ult., that his remark at the meeting of the Midland Association of Gas Managers referred only to his own experience of the compound, as the statement would, he thinks, hardly convey this to Mr. Hack's "fellow-members and everyone else" present on the occasion. Mr. Eveson adds that, beyond the testimonials already referred to, he has letters from the late Mr. John Somerville, in which he spoke very highly of the compound; and it was that gentleman's intention to forward to the JOURNAL some account of the favourable results he had obtained by its use.

The Transfer of the Rhyl Gas-Works to the Local Authority.—The formal transfer of the Rhyl Gas-Works, together with the stock-in-trade, to the Improvement Commissioners, took place last Saturday week; a cheque for £32,000, the purchase price, being handed to the Directors of the Company.

Deficiency in the Income of the Loughborough Corporation Water Department.—The scale of charges for water at Loughborough is about to be revised, so as to secure an income sufficient to cover the cost of the supply. It appears that the expenditure on the undertaking last year was £3500, exclusive of the amount charged to capital account; while the income was only £2200.

Kansas Water-Works and Irrigation Company.—At a meeting last Friday, at Winchester House, of the holders of the $1,000,000 first mortgage 6 per cent. gold bonds, redeemable in 1939, at which Mr. Spencer Chapman presided, a Committee of seven members was appointed to make a searching investigation into the question of the issue of the bonds, the liability of the promoters, &c., and it was decided that an assessment of 5s. per cent. should be made upon the bonds.

Thawing Frozen Water-Pipes.—A correspondent to *The Times* gives the following as a thoroughly successful plan for thawing frozen water-pipes: "The cock or valve at the upper end of the pipe should be removed, and the ice thawed as low down as possible. This can easily be done by attaching a yard or two of thin indiarubber tubing to a syringe filled with boiling water, and inserting it into the pipe. When no more can be done by this means, a concentrated solution of salt in boiling water is injected by the same tubing, and as much dry salt as possible added after, which gradually dissolves the ice below it." In the writer's case, the pipes were cleared after waiting about eight hours through the night.

MISCELLANEOUS NEWS.

THE MARKET FOR SULPHATE OF AMMONIA DURING THE PAST YEAR.

We have received from Messrs. Bradbury and Hirsch, of Mason's Buildings, Liverpool, a copy of their "Annual Review of the Market for Sulphate of Ammonia," for notice in the JOURNAL. It comprises, as usual, some general introductory remarks, and a review of the course of the market month by month, with tabulated statistics at the end.

Messrs. Bradbury and Hirsch commence by stating that the events of 1892 have not, with perhaps one exception, left any very conspicuous marks in the history of the sulphate of ammonia market. Its condition was hardly one favourable to the producer; and the year's average was, they regret to note, again a lowering one. Indeed, it is the record value for quite 25 years. There is, as a rule, an adequate cause for an unsatisfactory condition of this kind; and the authors of the "Review" think the newly-coined word "megalomania," which has found a place in current literature, and which may be said to express "the diseased estimate of the relative properties of things," represents the views now so readily taken of one of the most valuable of fertilizing agents. For is it not a poignant fact, they ask, that, whether on the part of the dealer and speculator, the consumer, or even of the farmer, a fixed idea exists that, however cheap this commodity may be, sulphate values, by some unexplained law—framed by the buying community—must for ever fall, and that the very mention of a possible recovery is sneered and mocked at? The "why and how" of this perverse notion, they admit they do not know; and it is difficult to guess at—the more so as consumers and dealers are, at times, not slow to discover the foible of their method. This much said, it must be assumed, they think, that values have been wilfully depreciated, principally by speculation; otherwise, one would have to seek the cause either in the demand not being equal to the supply, or else to conclude that the production had entirely overlapped the consumption. Of course, this has not been the case; and there existed strong proofs to the contrary, especially during the latter part of the year.

The authors have always made it a strong point in previous reviews that the day of over-production had not arrived; and to-day, they say, it seems as far off as ever. What more stubborn fact can be adduced than that, at the end of September last, every ton of stock was cleared out, and that the demand since has been quite sufficient to prevent accumulation of stocks to any extent? The months of heaviest production have, therefore, been passed without any pressure to sell being felt, and without prices coming down to that "abyss of depression"—viz., £9 10s. per ton at the ports—predicted months ago, and devoutly hoped for by those who rested their operations upon a further decline. Those who had this low range of values in their mind's eye must have been entirely oblivious of facts and figures; they cannot have given a thought either to the stocks or the shipments, nor to the claims of sulphate for being the cheapest nitrogenous fertilizer. The facts that the year closes with so small an amount of stock, and with no depreciation from the opening values of the year, speak for themselves.

Proceeding to take a little more extended view of the position, Messrs. Bradbury and Hirsch remark as follows: First as to figures. We had an agreeable surprise in January, when, owing to a very large Spanish demand, in consequence of increased duties to come into force in February, the market became buoyant; and an advance of 5s. to 7s. 6d. was established. Prices were easier in February; and very little change took place during March and April—the quotations then being £10 2s. 6d. to £10 5s. It was from the end of May till the beginning of September that the market was rather in a bad way, owing to adverse seasons (a poor consumption in consequence), and also through speculative manœuvres; and quotations relapsed to about £9 17s. 6d. But the demand towards the close of September, the evidence of the clearance of all stocks here and abroad, and the firmness of holders, brought about a satisfactory improvement, and an advance of about 5s. per ton, which was, in spite of the heavy production since, well maintained to the end of the year. We have consequently had no violent fluctuations, and the occasional "spurts" indicate the possibilities of the market. Then as to the production. Our tables show that the home production has not appreciably increased. A steady increase must, of course, be expected year by year. A great deal has been said about the considerable increase in the German production. But what of it, since it has evidently stimulated consumption, and has all been absorbed? This increase results principally from the extension of coke-ovens in Westphalia, Silesia, &c.; but a further increase seems doubtful, as these works at the present values of the products give such poor returns. The latter statement equally applies at home. Distilling coal for the bye-products, and not for illuminating purposes, will, however, ever remain a factor to be considered in the future production, as when prices of the so-called residuals reach something like their previous values—and the formation of syndicates have this as their object—coke-ovens or carbonizing works will assuredly be in extended operation again.

Referring next to the production of sulphate of ammonia, the authors point out that the increase in the supply from gas-works proceeds at the usual steady rate. The slight interference of the electric light with the consumption of gas is shown by statistics of gas lighting in France—the home of the electric light—since the inception of the latter system of illumination in 1878. In that year there were 687 places, with 9,943,434 inhabitants using gas; whereas in 1889 there were 1028 places, with 12,758,753 inhabitants, where it was employed. From iron-works the increase is still going on apace; and shale-works have furnished quite their previous quota. Other—and mostly fanciful—processes have disappeared from the scene. The world's production stands to-day somewhat as follows: United Kingdom, 157,000 tons; Germany, 70,000 tons; France, Belgium, and Holland, 45,000 tons; Spain, Portugal, &c., 2000 tons; America, 10,000 tons; Australia, &c., 1500 tons—total, 285,500 tons. Of the 157,000 tons produced in the United Kingdom, 103,000 tons

was made in England, and 52,000 tons in Scotland; and 112,000 tons of the entire bulk came from gas-works, against 107,950 tons and 102,150 tons in the two preceding years. As to the disposal of the fairly large production of 285,500 tons mentioned above, Messrs. Bradbury and Hirsch say they have in the present instance little to demonstrate. recollecting the fact that it has nearly all been used up; the output abroad being, with the exception, perhaps, of Australia, all consumed at home, and the English production is almost the only one which presents a special feature—about two-thirds of it being disposed of to the foreigner. Why it should not all be consumed at home, seeing the large quantities of nitrate and other nitrogenous material we import—and pay more for—is a problem to be dealt with on a future occasion. At present, at all events, we are depending largely upon the export trade, and therefore it is satisfactory to note that there is a considerable increase in the shipments—about 20,000 tons; and what is most satisfactory of all is that Germany, in spite of her own larger production, has taken a considerable quantity more than last year. Spain and Italy have almost doubled their consumption; while Belgium and Holland remain stationary, and America has only taken about half of last year's quantity. The exports show clearly that, if there is a falling off in the shipments on the year to one country, it is compensated by the requirements of another.

Referring next to the positions of sulphate of ammonia and nitrate of soda, Messrs. Bradbury and Hirsch regard the increased requirements generally as another proof that the latter has not yet succeeded in ousting the former from its position; nor do they consider, as they have often remarked, it is likely ever to do so—each having uses and purposes of its own. "But the mention of nitrate," they go on to say, "awakens thoughts about the future; for, in estimating it, we cannot leave its position out of consideration. Should nitrate become deficient in the spring, there will only be sulphate to fall back upon; and if we should go on consuming the latter, as we have done recently, there will not be much of it to fall back upon. As is well known, a combination exists in nitrate to limit the shipments; and this agreement has up to now been stringently adhered to. The consequence will be that in the coming spring there will be, according to the present visible supply, about 130,000 tons less nitrate available than last year. This means that, assuming the consumption to be only the same as then, there will be no surplus; but should the consumption equal that of the spring of 1891, there will be a deficiency of about 100,000 tons in April. And what will be the consequence? Shipments cannot be hurried forward in a day; and in the event of such scarcity, holders will not be slow in availing themselves of the rare opportunity of 'making hay;' and we may easily see the prices reaching 10s. per cwt. or more. Sulphate will then most certainly participate in the good fortune of nitrate. . . . . Why should sulphate remain in the undignified position of being sold at less money than any other nitrogenous material? We refer to our comparative figures of last year, which may remain undisturbed. It was then shown that for the ten years average (1881-1890) sulphate was accorded a premium of nearly 1s. per unit of ammonia over nitrate; at the end of 1891, 9s. 6d. per unit was paid for nitrate, but only 8s. 1½d. for sulphate; to-day sulphate is selling at the same cheap rate, and nitrate costs, if anything, a shade more. This desperate reversal seems unreasonable; and to make nearly 1s. 6d. per unit difference is not placing the two commodities in their correct relative positions. There is either too much value placed upon the one, or too little upon the other. Up to very recently, there existed always a difference of at least £2 to £3 (in favour of sulphate) between the two fertilizers; it is at present only £1 per ton. This anomalous position may be revolutionized in the coming spring; and the kinetic force of adverse speculation may receive a severe check, especially in the event of an early season."

Nitrate of soda seems to have followed a very similar course to that of sulphate of ammonia; and the opening and closing quotations of the year are also almost identical—viz., 9s. to 9s, 3d. per cwt. Prices began to give way in April; and there was a kind of collapse about the end of May, owing to differences among importers—the price falling below 8s. A recovery took place when the understanding about reduced shipments was arrived at among producers; and great firmness was noticeable during the last quarter—9s. being the lowest quotation.

The review of the market month by month is next given, from which we make the following extracts:—

JANUARY.—A better state of things was noticeable almost as soon as the year opened; and this improvement soon developed into an advance of prices. The total advance upon the December prices was about 10s. per ton—a satisfactory increase certainly, but insufficient, in view of the relative positions of the principal sources of nitrogen, and out of all proportion to what used to be the fluctuation in the market but very few years ago, when at "buying" times it frequently rose at the rate of £1 in a week. Quotations at the close were £10 12s. 6d.

FEBRUARY.—The month of February was not an auspicious one; and the reasons were not far to seek. There was rarely such an utter indifference as regards filling their requirements or increasing their supplies on the part of consumers, and they scrupulously withheld from the market; and, of course, while the farmers were so listless (the weather interfering so seriously with their operations), manure manufacturers could not be expected to be in the humour for new purchases—fresh orders coming in so sparingly and slowly. The buying was, therefore, almost entirely by the dealers and speculators, who seemed to have pocketed all the orders. A serious decline was, however, prevented by the speculators being compelled to buy in order to fulfil their engagements; and they were even obliged to pay full prices under pressure. Spot parcels generally were therefore not long in finding buyers; and the shipments during the months of January and February—over 20,000 tons—plainly showed that the production was all being consumed. As regards the actual movement in prices, it may be roughly stated that values declined about 5s. per ton since the end of January; but during the closing days of February, the quotaions were very steady. Value at the end of February, £10 7s. 6d.

MARCH.—March, with all its dulness, increased by artificial depression, did not, after all, prove a very disastrous month, as far as values were concerned. At the close of the month, there was a slight hardening tendency, although prices at the beginning and the end were identical—viz., £10 5s. per ton. Both Germany and the home trade were active; but the business was greatly from hand to mouth—an impression having been created that prices would still be lower. It was in this month that large speculative transactions took place for future delivery on the basis of £10 to £10 2s. 6d.

APRIL.—The season was one of the poorest on record, the demand absolutely insignificant, and what requirements there were, were filled surreptitiously, principally by the speculators. The purchasing of the latter even was desultory; they having been able to fill their requirements by easy stages, owing to the deficiency of the consumptive demand. The paucity of the requirements was, no doubt, a factor greatly to the fore during April, when only for a short time spot parcels were in urgent request. But as the shipments to the end of the month amounted to about 40,000 tons, and were, therefore, fully up to those of last year, it will scarcely require to be pointed out that consumers were filled up before the season arrived. Prices, in spite of all, did not lose much ground; the decline being only about 1s. 3d. per ton. The price at the close was £10 3s. 9d.

MAY.—The abrupt closing of the season, and the collapse of the nitrate market were sufficient factors to impress the sulphate market with a feeling of despondency, and create the stagnation which existed during this month. When to this there is added the speculative manœuvres, it does not require any elaborate effort to discern the condition of the market. The collapse of nitrate was due to the sudden breaking up of the understanding among importers to maintain prices; and the fall of nearly £1 per ton could not remain without influence upon the sulphate market—causing a detrimental bias in the minds of consumers. The depression was further aggravated by the low prices accepted for future delivery by Scotch makers. German consumers seemed to have greater confidence in the market than the sellers on this side; for the former contracted a fair amount of supplies for future delivery in the neighbourhood of £10. Actual spot prices were steady during the first half of the month at £10 2s. 6d.; during the second half, they declined 2s. 6d. to 3s. 9d. per ton.

JUNE.—There was not much satisfaction to be eked out of the doings in the market during June, as far as the course of prices was concerned; but there was this redeeming feature: Circumstances indicated that the turning-point had come, and that a further decline was staved off. Nitrate was hardening again; and more confidence was shown in sulphate values by the greater inclination to secure forward contracts, even at a fair advance over spot values. The improvement in nitrate was due to the agreement among producers to limit the total exports. Prices came down momentarily to £9 15s.; but at the close 2s. 6d. to 5s. advance was quoted.

JULY.—It was a matter of surprise that, although stocks were at a very low level, and the production was almost at its smallest, a sickly feeling prevailed; and this in spite of a fair demand and a ready disposal of spot parcels. But, after all, a feeling of surprise should not have been provoked, because dealers were all more or less committed to low summer prices; and it was to their interest, whether by fair means or foul, not to let prices advance. Sales were even made at a loss, to attain the object in view. Prices ruled between £9 17s. 6d. and £9 18s. 9d.; but at the close of the month the figure of £9 17s. 9d. was hardly obtainable.

AUGUST.—As the demand during this month was on a fair scale throughout—considering the time of the year—and as the stocks were light, it was not unreasonable to anticipate that prices would harden a little. They did not, however, do so; and makers had to find consolation in the fact that they did not decline further. That the dealers did their utmost to lower quotations was well known, and that they did not succeed was a favourable index to the position—showing, to some extent, its soundness. Prices generally remained unaltered; and £9 17s. 6d. was still the quotation at the end of the month.

SEPTEMBER.—A turn in the ebbing tide came at last; and consumers themselves were entirely taken by surprise—the change coming actually at a time when the production begins to increase and tests the market. The month opened quietly enough. But it was the calm before the storm; and such a sudden demand, sweeping away in a remarkably short time both stocks and production, has rarely been experienced. It was, indeed, without precedent. One incontrovertible fact was brought glaringly to the surface—that consumers were entirely bereft of stocks; and it was difficult to conceive why they allowed themselves to be "caught napping." Manure manufacturers wilfully allowed their stocks to run out; and they were consequently obliged to buy as best they could—in many instances having to refuse orders for want of supplies. The advance during the month was about 5s. per ton; and, although satisfactory so far as it went, it was hardly commensurate with the then existing state of things. The value at the close was £10 2s. 6d.

OCTOBER.—It was predicted in September that the scarcity of supplies then apparent would be more than counterbalanced by the heavy October production; and that there would be an ample surplus over the requirements. This, however, was exactly what was not the case. To everybody's surprise, the available stocks, as well as the current production, were used up; and, if prices did not show a corresponding improvement, it was due to ever the same cause—the opposition of the dealers (and, of course, consumers as well, though in a less degree) to any improvement. That the "bear" manœuvres had so little effect, proved the soundness of the position; and, but for the weakness emanating from London, the complexion of the market might have been a totally different one. The strength of the position prevented a giving way of prices, excepting a temporary weakness; and the figure at the close remained the same as at the end of the previous month—viz., £10 2s. 6d.

NOVEMBER.—The market at the beginning of the month exhibited a slight weakness; but it was short-lived, and values were well maintained throughout. It was rumoured in the course of the month that a large quantity of sulphate was "up the sleeve" of certain holders. The object of this report was clear; bnt it remained uncorroborated. In fact, disappointment was rife that a larger quantity was not on the market; and clearly this was a revelation to many buyers, who expected to see sulphate freely offered and pressed for sale, and a falling market in consequence. Undeterred by the position, large

orders were taken for December delivery, the wisdom of which course was far from clear. The range of prices during the month was from £10 1s. 3d. to £10 5s., according to time of delivery and make.

DECEMBER seems to have been a sort of "happy hunting-ground" for the speculators. Orders from consumers direct were scanty—perhaps for the simple reason that they had previously been absorbed by the dealers; and it is almost needless to mention all the manœuvres to which they resorted to weaken the market and to secure parcels to their advantage. Rumours were constantly in the air of absurdly cheap, but untraceable business; but it is an open secret that full prices were paid "on the quiet," and the actual reduction on the open market was very insignificant. £10 2s. 6d. was the value during the early part of the month; and prices declined to £10 1s. 3d. about the middle—the market closing very quietly at £10.

From the tables which are given at the end of the "Review," we take the following:—

Production, Deliveries, and Exports of Sulphate of Ammonia during the Past Three Years.

	1890. Tons.	1891. Tons.	1892. Tons.
Production—			
England, Scotland, and Ireland from all sources	134,000	143,000	157,000
Deliveries and Exports—			
Germany, Denmark, Sweden, Russia, &c.	30,000	28 000	33 000
France, Spain and Italy	16,000	19,000	30,000
Belgium and Holland	22,000	23 000	24,000
America and Colonies	18,000	20,000	18,000
Home consumption	42,000	43 000	43 000
Stocks at works	6,000	10,000	3,000
	134,000	143,000	157,000

Comparative Weekly Prices of Sulphate of Ammonia and Nitrate of Soda during the Year 1892.

Week ending	Sulphate of Ammonia. Per Cwt.	Nitrate of Soda. Per Cwt.	Week ending	Sulphate of Ammonia. Per Cwt.	Nitrate of Soda. Per Cwt.	Week ending	Sulphate of Ammonia. Per Cwt.	Nitrate of Soda. Per Cwt.	Week ending	Sulphate of Ammonia. Per Cwt.	Nitrate of Soda. Per Cwt.
	s. d.	s. d.		s. d.	s. d.		s. d.	s. d.		s. d.	s. d.
Jan. 2	10 3	9 3	April 2	10 3	9 1½	July 2	9 10½	8 4½	Oct. 1	10 1½	8 3
„ 9	10 4½	9 3	„ 9	10 3	9 0	„ 9	9 11	8 3	„ 8	10 1½	8 4½
„ 16	10 7½	9 4½	„ 16	10 2	8 10½	„ 16	9 11	8 3	„ 15	10 0	8 6
„ 23	10 7½	9 7½	„ 23	10 2	8 9	„ 23	9 10½	8 3	„ 22	10 1	8 9
„ 30	10 7	9 6	„ 30	10 1½	8 9	„ 30	9 10½	8 3	„ 29	10 2½	9 0
Feb. 6	10 7	9 6	May 7	10 1½	8 7½	Aug. 6	9 10½	8 3	Nov. 5	10 1	9 3
„ 13	10 6	9 6	„ 14	10 0	8 6	„ 13	9 10½	8 3	„ 12	10 1½	9 0
„ 20	10 4½	9 4½	„ 21	9 10½	8 0	„ 20	9 10	8 3	„ 19	10 2	9 0
„ 27	10 4½	9 4½	„ 28	9 10	8 0	„ 27	9 10½	8 3	„ 26	10 1½	9 0
March 5	10 3	9 3	June 4	9 10	7 10½	Sept. 3	9 10½	8 3	Dec. 3	10 1½	9 0
„ 12	10 3	9 3	„ 11	9 9	8 0	„ 10	9 11	8 3	„ 10	10 1½	9 0
„ 19	10 2	9 1½	„ 18	9 9	8 1½	„ 17	10 0	8 3	„ 17	10 1	9 0
„ 26	10 3	9 1½	„ 25	9 10	8 3	„ 24	10 1½	8 3	„ 24	10 0	9 0
									„ 31	10 0	9 0

Average Prices per Ton of Good Grey (24 per cent.) Sulphate of Ammonia, f.o.b. Hull.

YEAR.	JAN.	FEB.	MARCH.	APRIL.	MAY.	JUNE.	JULY.	AUG.	SEPT.	OCT.	NOV.	DEC.	Average.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1883	18 15 0	18 3 9	18 8 0	17 3 9	16 18 3	17 5 6	16 5 0	16 7 0	16 10 0	15 5 8	13 17 0	13 13 0	16 11 0
1884	14 0 6	14 5 0	14 11 6	14 10 6	14 7 6	14 13 9	14 19 0	15 8 6	15 6 3	14 12 6	13 12 0	13 3 1½	14 9 3
1885	12 12 9	12 1 3	11 18 3	11 15 4	11 3 6	11 18 3	11 14 3	11 16 6	11 2 6	10 12 6	10 8 9	10 5 9	11 9 1½
1886	10 14 6	11 5 7½	12 11 11	12 5 0	10 17 0	11 0 7½	11 3 6	11 5 7½	10 18 5	10 13 9	10 11 11	10 15 7½	11 3 7½
1887	11 12 0	11 14 6	12 3 9	11 5 3	11 13 3	12 3 9	12 12 6	12 12 0	11 17 0	11 9 0	11 9 9	11 19 6	11 17 8
1888	12 15 8	12 5 8	12 0 0	11 18 2	11 7 6	11 13 0	11 12 10	11 9 8	11 7 9	11 14 8	12 6 7	12 5 0	11 18 0½
1889	12 10 7½	12 4 8	11 19 0	11 18 9	11 19 1	11 19 6	11 16 7	12 0 9	12 2 10	11 18 2	12 1 0	12 5 4	12 1 4½
1890	12 0 11	11 16 10½	11 16 0	11 7 2	11 5 3	11 4 1	11 8 5	11 12 3	11 11 3	11 10 4	11 1 3	10 14 1	11 9 0
1891	10 13 2	10 18 9	11 5 11	11 3 9	11 0 3	10 17 6	10 13 0	10 16 3	10 14 0	10 11 3	10 7 6	10 3 9	10 15 5
1892	10 9 9	10 9 1	10 4 8½	10 4 0	9 19 1	9 15 7½	9 18 0	9 17 2	9 19 8	10 1 9	10 2 6	10 1 3	10 1 10½

Average Prices, 1870–1882.

1870	1871	1872	1873	1874	1875	1876	1877	1878	1879	1880	1881	1882
£16 ..	£19 ..	£21 ..	£18 3s. 9d. ..	£17 2s. 6d. ..	£18 10s. ..	£18 12s. 6d. ..	£19 16s. 3d. ..	£20 5s. ..	£18 8s. 9d. ..	£19 ..	£20 4s. 6d.	£20 8s. 6d.

LABOUR TROUBLES AT THE ROTHERHAM GAS-WORKS.

Christmas time was not a very pleasant one at the Rotherham Gas-Works, owing to the conduct of some of the stokers. The trouble began on Christmas Eve, when the night foreman presented himself in a condition which prevented him from properly doing his work; the result being that the working manager (Mr. Goodwin) had to remain on the premises during the greater part of the night to see that things went on properly. On the following day the matter was reported to the Engineer and Manager (Mr. C. B. Newton), who gave instructions that the man should be dismissed. When the night shift came on at nine o'clock in the evening, and learnt that the foreman had been discharged, they consulted with the shift then going off duty, and decided not to work. An hour later, Mr. Newton was called to the works, and found everything in the retort-house at a standstill, and the men in the mess-room. On inquiring the meaning of the stoppage, he was met by a direct refusal of the men to start work unless the foreman was reinstated. This, of course, Mr. Newton at once declined to do; and he warned the men of the risk they were running, and threatened to take proceedings against them. The necessity for prompt action will be apparent when it is mentioned that at this time there was only a three hours' supply of gas in the holders. At about midnight beter counsels prevailed among the men, and work was commenced. Mr. Newton conferred with the Chairman of the Gas Committee on the matter, and it was decided to proceed against the nine men composing the night shift for breach of contract, and against one of the outgoing shift (who is the local Secretary of the Gas Workers' Union) for inciting the others. We learn that when the men received their summonses, the President and Secretary of the Union for the Sheffield district (of which Rotherham is a branch) had instructions from the London office to meet the authorities at Rotherham, with a view to the arrangement of a settlement. The men also placed themselves in the hands of these two officials, who asked for an interview. This was granted; and the meeting took place last Friday; the Mayor (Alderman Gummer), the Town Clerk, the Chairman of the Gas Committee, and Mr. Newton being present. The deputation admitted that the men were in the wrong, and asked for the withdrawal of the summonses. After arguing the matter fully, the request was acceeded to, on the condition that the men sent in a written apology, and paid the legal expenses. This the deputation promised to advise the men to do; and on the following day a letter was received from the nine night-shift men expressing regret for their action, and agreeing to pay the costs. The local Secretary, however, who was summoned for inciting the others, would not agree to the conditions; so that in his case the law will probably take its course.

BELFAST CORPORATION GAS SUPPLY.

Insurance Companies and the Storeage of Oil on the Works.

At the Meeting of the Belfast Corporation on Monday last week—the LORD MAYOR (Sir Daniel Dixon, J.P.) presiding—there was an interesting discussion on the question of the increase of the rate of insurance on the gas-works, owing to the storeage of light hydrocarbon on the premises.

Alderman CONNOR moved the adoption of the report of the Gas Committee on the subject, which was as follows: "Your Committee have to report that the insurance companies having policies of insurance on the gas-works have intimated their intention of increasing the rate of insurance from 3s. 6d. to 10s. 6d. per cent. This action has been caused by the Committee storing light hydrocarbon on the premises; and as the rate proposed is a much higher one than your Committee can see their way to pay, they have decided to become their own insurers, unless the companies continue to insure at the present rate—thus reverting to the plan originally acted upon by the old Gas Company and by the Corporation when they acquired the works."

Mr. LINDSAY having seconded the motion,

Mr. HARPER said the insurance companies, who were good judges on this subject, must be of opinion that the danger of fire was considerably increased by the storing of light hydrocarbon on the premises. The Gas Committee, by taking the risk upon themselves, transferred the risk from the insurance companies to the Corporation. This was wise so far as the gas-works were concerned; but if there was so much fear of danger to the gas-works, was there, he asked, no danger also to the surrounding property? He thought something should be done to prevent the rate of insurance for the neighbouring property being increased threefold.

Alderman Sir J. H. HASLETT thought that the question was whether or not the oil referred to could not be so isolated—in its storing at least—as to prevent a general rise in the insurance rate for the whole works. He did not apprehend that there would be any danger in the use of the oil, providing reasonable care were taken. Unless under exceptional circumstances, he thought the ratepayers should not be taxed by an insurance fund.

Mr. J. M'CORMICK believed that the principle of self-insurance was a beautiful one in theory; but, when applied in practice, it might become dangerous. For twenty years the Gas Committee had considered it necessary to insure against any risk in connection with the gas-works; and now, when the risk had increased, they had decided not to insure at all, but to become their own insurers. Their action was illogical and inconsistent.

Alderman CONNOR said it would be well to explain the circumstances under which the Committee came to have the hydrocarbon in question

stored on the premises. The members were aware that for some time past they had considered the plant for the manufacture of gas inadequate to supply the requirements of the consumers, and that, therefore, they had been obliged to look round for some means of increasing the output, to provide for emergencies likely to occur through the increase of the population and the greater demand for gas. They had adopted as one of their expedients the enrichment of the gas by hydrocarbon. This was a light oil of the density of 61-100ths that of water, and was, therefore, very volatile. It had been regarded in time past with great suspicion by insurance companies; but he thought they were now coming to see that it was not so dangerous if care were taken. At the same time the companies were very slow to move; and the mere fact of their having this hydrocarbon on their premises had induced them to increase the insurance on the gas-works from 3s. 6d. to 10s. 6d. per cent. This might or might not in the judgment of some people be an extravagant increase; but the Committee considered it so extravagant that they thought it wise to become their own insurers. As Chairman of the Gas Committee, he was, of course, entirely in the hands of the Corporation. If they had any objection to becoming their own insurers, they must adopt some other course; but if they would be counselled by him, they would become their own insurers, as they were formerly, and gradually accumulate a fund which would meet any probable or possible risk arising from fire. He failed to see how they were illogical in taking a course of this kind. With regard to the storeage of the oil, it was kept in a steel tank under some of the buildings at the works. This diminished the risk of any heavy waggon or great weight being passed over it; and the Gas Committee thought, considering the very limited space at their disposal at the works, they had put the tank in the safest place they could find. Of course, if they had larger space, they could isolate it more carefully, and bring the supply down through a very small pipe, to the point where it was used, and so diminish the danger somewhat. He could assure the Corporation, however, that every precaution had been taken.

Mr. M'Cormick inquired if it were a fact that some of the insurance companies had undertaken to insure at the old rates, provided the oil was removed to a safe distance from the buildings.

Alderman Connor said he was not aware that any mention of that had been made by the companies; but they were not unanimous in raising the rate. A small minority were willing to insure at the old rate.

The motion was then carried.

THE FUTURE GAS SUPPLY AT COVENTRY.

At the Meeting of the Coventry City Council last Tuesday, the Gas Committee presented their report dealing with the future gas supply of the city. The report is the outcome of a resolution passed by the Council in committee as far back as July 27, 1891, as follows: "That it be recommended to the Council to authorize the Gas Committee to draw up a report stating what steps should, in the opinion of that Committee, be taken to supply the city with gas, in view of a probable annual increase of 6 per cent. for the next ten years." At the time this resolution was passed, the anticipation of an annual increase of 6 per cent. was justified by the history of the previous few years. During the year and a half that have since elapsed, however, the increase of consumption has fallen off; and the Committee are now of opinion that the increase during the next few years will be much less than that indicated by the resolution, and that for at least two years to come all the requirements of the undertaking may be met by a re-arrangement of the present works. They accordingly recommended that the further consideration of the future gas supply should be adjourned.

Mr. W. Andrews, Chairman of the Gas Committee, in proposing the adoption of the report, said the Committee had given the subject their most careful attention; and they had come to the conclusion that the estimate of an annual increase of 6 per cent. was too high. He had drawn up a list of the percentages of increase or decrease of consumption in the city during the past sixteen years; and it was found that the figures were mainly brought up to the amount of 6 per cent. by the consumption that had taken place in four years—viz., 1887, 1889-90, 1890-91, and 1891-92. The Committee looked upon these years as exceptional ones—the increase being, in fact, brought about by the great, but temporary, development in the bicycle business. The question arose whether such abnormal increases were likely to go on in the future. The Committee were of opinion that they would not; but that the increases would drop down to something like a normal amount. During the ten years previous to 1887, it was found that the average annual increase in the consumption, taking one year with another, was 4 per cent. In the case of The Gaslight and Coke Company, the annual average increase for the last twelve years had been rather less than 3½ per cent. The Committee, therefore, thought that 4 per cent. for the future was much more likely to be the annual average increase than 6 per cent. The difference this would make would be mainly this: That if the annual increase was 6 per cent., the consumption would be doubled in about twelve years; whereas if the average increase were only 4 per cent., it would take eighteen years to double the consumption. There was another point, and that was the introduction of the electric light into Coventry. Although the Gas Committee were of opinion that the electric light would not be likely to interfere with the present consumption of gas, yet, as the Council had pledged itself to introduce that light into Coventry, it was certain to come into use to a moderate extent. Although, as he had remarked, it was not likely to interfere with the present consumption, it was equally certain that every electric lamp put up would be put in place of a gas-light that would otherwise be erected; and, in consequence, the future increase in consumption of gas, instead of being an expanding one, was likely to gradually diminish. When the Gas Committee were first constituted, it was believed that the present works would be large enough to go on with without spending a great amount of capital; and he might point out that, during the eight or nine years the Corporation had been in possession of the works, only from £24,000 to £25,000 of capital had been expended altogether, yet the output had been nearly doubled. Of the sum mentioned, only a little more than £16,000 had been laid out in enlarging the works; the balance having been expended in laying new mains through new streets, and in purchasing property that had not yet been used. The Committee had carefully considered the alternative of enlarging the present works or building entirely new ones on a site outside the city. The neighbourhood of the city was caused to be thoroughly examined, an eligible site was ascertained, and estimates were made of the cost; and it was found that probably about £60,000 would have to be expended in new works, if anything at all. Taking all things into consideration, the Committee were of opinion that they could go on for a year or two as they were, and were rather averse to expending a large amount of capital at present in extending the gas plant. The Committee therefore recommended a policy of caution for the present, and thought it would be well to wait until the electric light was introduced in the course of a year or two. They would then be in a better position to judge of the course matters were likely to take. In the meantime, the question remained open, and could be brought forward at any time.

Mr. Pulley seconded the motion.

After a brief discussion,

Mr. Andrews, replying to a question, said the Gas Committee were bound to keep the works in an efficient condition; but they would not enlarge them without the sanction of the Council.

The motion was then carried unanimously.

ALLEGED IRREGULARITIES AT THE BANGOR GAS-WORKS.

At a recent Meeting of the Bangor City Council, Mr. T. G Williams made certain statements with respect to the management of the gas-works and the conduct of the Gas Manager (Mr. J. Smith) in connection with the coal contracts, in consequence of which a Special Committee was appointed to inquire into them, and fixed upon the following points of inquiry: (1) That they had been advised by the Gas Manager to accept a contract from a colliery which did not exist; (2) that the coal did not supply the stipulated amount of gas; (3) that the coal supplied was not screened as per contract; (4) that the coal was supplied from different collieries. The Gas Manager was requested to report on the above points. At a subsequent meeting of the Committee, Mr. Smith read a lengthy report, in which he denied having advised the acceptance of a contract from any colliery; he had simply laid before the Committee facts relating to the coal, price, production of gas, &c. As to the complaint that the coal did not yield a certain quantity of gas per ton, he stated that there was no stipulation in any contract as to the amount of gas yielded per ton of coal. The coal delivered at the works under Mr. G. J. Eveson's contract was now, and always had been, "screened" coal. The coal had been sent from different collieries; but they had been advised of that by the contractor. Mr. Smith also entered at considerable length into previous disputes with Mr. Williams with respect to the coal supply, in which he had been exonerated; and yet, though insinuations had then been made that he had misled the Committee and falsified his books, not one of those who made the charges had ever apologized for what he had said. He pointed out that if the contract with Mr. Eveson ceased at once, there would be an action-at-law, in which he (the Manager) would have to give evidence against the Corporation. He also denounced the conduct of Mr. Robert Owen (another member of the Council), who, while denying that they had anything against his personal character, stooped to ask the boy who weighed the coal "whether he weighed the coal that went to Mr. Smith's house." If Mr. Owen had any doubt as to the coal supplied to his (the Manager's) house being weighed and charged for, he could easily have had the information from the Borough Accountant; and it was a mean and despicable act on his part. The Committee having heard Mr. Smith's statement, two of their number were deputed to draw up a report on the whole question. This they did; and the document was of a most detailed and voluminous character. They found that the coal contracted for was best North Staffordshire Bambury gas coal, from a Kidsgrove colliery; that it came from Talk-o'-the-Hill pit; that the coal supplied was from the same pit as the sample tested; that there had been no attempt on the part of the Manager or of the contractor to conceal the fact, or to mislead the Committee; that the objection raised on this point, of which so much had been made, was vexatious and trivial; and that it was not correct to say that the Manager advised the Committee to accept the tender. As to the charges that the coal did not yield a proper quantity of gas, the Committee concluded "that the coal now used works well, and yields a good average quantity of gas in working, as compared with the test, and is therefore in this respect thoroughly satisfactory." The Committee were likewise fully satisfied that the coal was "screened gas coal," complying with the terms of the contract. They also found, with respect to the complaint that coal was supplied by the contractor from different collieries, "that there was no evidence of any valid complaint being made against the coal supplied." In conclusion, the Committee stated that they had spent several hours in discussing trivial objections and statements for which there was little or no foundation; and as to the reckless insinuations against the Manager, they expressed their high appreciation of the way in which Mr. Smith had always performed his duties, and of the conclusive manner in which he had met all the charges implied against him. They also declared their unabated confidence in his integrity and capacity to discharge the duties appertaining to his post. With respect to Mr. Smith's reference to Mr. Owen, the Committee expressed their satisfaction with the assurance of the latter gentleman that, in his conversation with the boy who weighed the coal, he did not intend to cast any reflection on the Manager; and Mr. Smith had accepted this explanation.

At the Meeting of the Council last Wednesday, Mr. Roberts, the Chairman of the Gas and Water Committee, moved the adoption of the report of the Special Committee, and commented severely on the manner in which the charges against the Gas Manager had been spread about the town. Mr. Hughes seconded the motion; and then Mr. Williams defended the conduct of himself and others in making the charges they did, and repudiated any personal feeling against Mr. Smith. After a lengthy discussion, Alderman Cameron moved that

he remarks of the Manager with regard to Mr. Owen be expunged; and Mr. Roberts accepted this amendment. Alderman Jones said he was sorry he could not vote for the adoption of the report, even as amended. A great portion of Mr. Smith's report was a mere tirade against members of the Council, and most disrespectful. Dr. Rowland Jones submitted that the Manager was not disrespectful to the members; that the attacks made on him by Mr. Williams were most shameful; and that Mr. Smith would be lacking in the qualities necessary for his position if he submitted to such blows as had been aimed at him. The minutes of the Committee were then adopted with but one dissentient—Mr. Owen.

THE ST. PANCRAS ELECTRIC LIGHTING STATION.

The First Year's Working Expenses.

The Vestry Clerk of St. Pancras (Mr. T. Eccleston Gibb) has lately presented to the Vestry an exhaustive report on the general and financial working of the central electric lighting station which they have established for their district; and we take therefrom the following particulars.

The total expense of the installation, including the estimated cost of those portions not yet completed, is put at £91,493, of which £10,524 is for land, £35,034 for stations and generating plant, and £34,894 for distributing plant. The Vestry have raised £10,000 from the County Council, £60,000 from the Prudential Assurance Company, and the National Bank have advanced £13,797. The net rents of the reserved portion of the site come to £392; and there is a balance of £7304 due on the completion of the works now in hand. In the course of some remarks explanatory of items in the accounts, Mr. Gibb stated, in regard to the total outlay for street trenches and conductors, including the extensions in hand—£34,894—that the original expenditure contemplated provision for current equal to 25,000 16-candle lamps and 90 arc lamps, although the machinery was designed for only 10,000 16-candle lamps and 90 arc lamps. This was necessary, he says, as it could not be foreseen where the current would be taken up. Since the Vestry commenced to supply, it has been necessary to extend still further the original provision, to meet demands in places not included in the scheduled area, so that now they have provision for more than 30,000 16-candle lamps, as well as the 90 arc lamps. The result of this is that at present nearly two-thirds of the capital expended on trenches and conductors—say £20,000—is lying idle, and must continue so until further generating plant is put down at the station. The arc lamp plant will be fully charged as soon as the lamps now being erected are put in use; so that the arc lighting plant also must be extended before any more public lighting can be undertaken. Two dynamos have been erected for the 90 arc lamps—one being kept as a stand-by in case of accident. If two more machines were erected, the one stand-by would still cover any risk, and 270 arc lamps could then be supplied. These would, it is stated, be sufficient to displace the whole of the 1200 gas-lamps within the area which can be economically served from the present station.

Passing on to give particulars as to the first year's working of the station—the twelve months ending Nov. 8, 1892—Mr. Gibb explains that some of the expenditure was incurred at a date anterior to the first supply of the current. Of the total expenses—£6552—£2306 was for coals, £2990 for salaries and wages, and £354 for water, oil, waste, &c. The receipts for current supplied from Nov. 9, 1891, to the end of September, 1892, are given as £4691; those for October, as £1023; those for the eight days of November are estimated at £290; the public lighting is put at £1452; and meter connections and sundry small receipts, at £164—making a total of £7620. As the expenditure was £6552, there is shown a balance of £1068 towards meeting the interest charges and the repayment of loans. With regard to the foregoing figures, Mr. Gibb makes the following observations: "(1) It has been already pointed out that the expenditure is for more than a year. It may also be said that it has been upon a plant which, for a large part of the time, has not been doing a tithe of the work it was capable of performing. During last winter we had few customers; and during the summer, but little light was required. (2) The receipts for current from Nov. 9, 1891, to Sept. 30, 1892, were only £4691 3s. 5d.; whereas during the month of October, when the plant was still not in full use, they amounted to £1023 5s. 2d. From this it may be expected that the total annual income from this source will be, without any extension of plant, &c., at least £10,000 a year; and this is exclusive of the value of current used for public lighting, which will add another £3000 or so. The £10,000 is a low estimate, as experience proves that each 16-candle power lamp installed will yield an income of £1 per annum at 6d. per unit; and as 13,000 lamps installed represents in this district 10,000 lamps simultaneously at work, the income may be expected to reach £13,000, or even more, per annum, and this without taking any account of the consumption for motive power during the times of light load. (3) With reference to the balance shown of receipts over expenditure of £1068, this is but a small contribution towards the amount charged for interest and instalments of principal. Nothing has been allowed for depreciation. The reason for this is that the six months' maintenance under the contracts has but recently expired, and some of the plant has been scarcely used as yet. No large provision for depreciation will ever be necessary, because electric lighting plant must be kept in perfect condition by continuous repairs and renewals in detail."

Referring to the possible economies that may be effected, Mr. Gibb says there is one source of profit that has not developed so rapidly as was expected, and that is the use of electricity for motive power. He says it is a subject to which the Chairman of the Committee has devoted much time and attention, and is one upon which he (Mr. Gibb) laid much stress in his report to the Vestry in 1882. When recently it was determined to reduce the price of current for day supply, it was naturally expected that a considerable demand for motive power would arise; but it is to be regretted, he says, that as yet the advantages offered are not realized by the many small manufacturers to whom this would certainly be a boon.

BIRMINGHAM CORPORATION WATER SUPPLY.

The New Water Scheme and the Charges for Water—Mr. T. Starkey's Superannuation.

At the Meeting of the Birmingham City Council last Tuesday—the Mayor (Mr. Alderman Lawley Parker) presiding—the above subjects were under consideration, and gave rise to interesting discussions.

Alderman Sir Thomas Martineau moved that the Council approve of the report of the Water Committee dealing with the revised scale of water rents and charges (see *ante*, p. 28). He said it was not an agreeable thing to ask the Council to impose increased charges; but the disagreeableness of the task was mitigated by two facts. One was that the Committee were asking them to carry out the policy which had been fully and almost unanimously approved by the Council; the other was that they were simply asking for the reimposition—and that only to a partial extent—of charges which had formerly existed, and which had been remitted by the Council. In going through the figures given in the report, Sir Thomas said that the intention was to increase the profits of the department to such an extent that, by their accumulation, aided by the natural growth of the water-rental, and by the abolition of the expense of pumping, the Corporation might get such a surplus as would enable them to carry out the new scheme without imposing any further burden upon the consumers or ratepayers. In 1891, the Committee said it would be necessary to add £28,000 a year to the water-rental. This had grown to nearly £29,000, by the additions that had been made during the year; and the problem the Committee had had to solve was how to raise this sum. The water-rental at present amounted to £140,247; and the increase of £29,000 might be taken roughly as one of 20 per cent. If they had been able simply to raise the charges to all classes of consumers, it would have been a very easy matter to obtain the necessary increase in revenue; but this was rendered impossible by the limits imposed upon them by Parliament. There were nearly 15,000 houses let at 2s. 9d. per week, the water-rate on which was already 6s. per annum. As this was the parliamentary maximum, no increase could be gained from these houses. Again, on the 3s. 9d. per week houses, estimated to number 13,866, the charge was already 8s. a year—also the parliamentary limit. There was an intervening class, the houses letting at 3s. 6d., which were at present paying 6s. a year, and on which it was proposed to charge 8s. a year, which was the maximum allowed in the Act, and was the charge on these houses before the revision took place. For a house which probably held five people, he thought a charge of 8s. per annum for water was very low indeed, being only 1s. 7d. per head. As he had pointed out, there were about 29,000 of the poorest class of houses from which the Committee could not obtain any increase of revenue. At the other end of the scale they had houses let at £50, the charge on which at present was £2 6s. per annum. It was proposed to raise this to £2 17s., which was the parliamentary maximum. On houses let at more than £50 per annum, they proposed to raise the charge from 5 per cent. to 6 per cent. on the rateable value. This increase brought the charges to the parliamentary limit, and was equal to a rise of 20 per cent. Sir Thomas then dealt with the correspondence which has appeared in the local papers on the subject.

Mr. Shammon seconded the resolution.

Alderman Baker said that, while appreciating the difficulties of the Committee in preparing the table, he was sorry they were obliged to reintroduce some of the inequalities which previously existed; but he was not prepared to make any suggestion by which they could be altered. They were, however, of a startling character, because the scale varied from no advance in one class to 50 per cent. in another class. He thought there might be some modification in the class of 6s., 6s. 3d., and 6s. 6d. houses, where there was a jump from 10s. to 15s., especially when they considered that there was no increase in the class of houses paying rents of 5s. 3d., 5s. 6d., and 5s. 9d. He could not quite understand why the middle class—the tenants at annual rents paying rates and taxes—should pay so very much within the parliamentary scale. If the Committee would look at the scale again, and adjust the rates in respect to the middle-class houses, they might be able to relieve some of the extreme cases in the smaller houses.

Mr. Granger considered the new scale would press hardly on the small-house occupiers by giving the landlords an opportunity of raising the rents. In addition to this, he did not see why an advance of 50 per cent. should be imposed on the houses with rents ranging from 6s. to 6s. 6d. per week, while the increase in other classes was considerably less.

Mr. Bradley pointed out that there were several classes of houses in which the proposed rate showed an increase of 50 per cent. There were numerous incongruities in the table; and the Council were in a difficulty in dealing with such a mass of figures that they would not experience in an ordinary matter.

Mr. Bowkett said the occupiers of houses at about 6s. a week would feel the increase much more than the occupiers of houses at a higher rental. He hoped the Committee would see their way to adopt the suggestion of Alderman Baker, and revise the table,

Mr. Ball would also be glad if the table were revised, in order that no opportunity might be given to the landlords who paid the rates to raise the rents. If they increased the rate on the 6s. houses by 5s., the landlords would have the opportunity; but if the increase were only 3s., the landlords could not conscientiously raise the rents.

The Mayor said the Committee took the maximum standard, which they could not exceed. In some cases the tenants and owners had been paying very much below that standard; and this was the reason the increase was so much. They had had the benefit in the past, and should not they, therefore, be prepared to pay in proportion to the others in the future? They could not go beyond the maximum. They had to provide a certain sum, and they were now a year behind, for the charges ought to have been raised last year. In these circumstances, he was firmly of opinion that, if the report were referred back to the Committee, they would bring up practically the same scale again, because they had good reason for every line.

Mr. Stevens moved, as an amendment, that the new scale of charges experience referred back for reconsideration.

Mr. Whateley seconded the amendment.

Sir THOMAS MARTINEAU, in reply, said he regretted he could not accept the amendment, nor withdraw the scale of charges for further consideration. He had pointed out that there was a certain sum of money to be raised, and that they could not do with less.

On being put to the vote, the amendment was defeated by an overwhelming majority; and the resolution was then carried, with a few dissentients.

Alderman Sir T. MARTINEAU next moved—"That the Water Committee be authorized to pay to Mr. Thomas Starkey, Secretary of the Water Department, his present salary of £700 up to the 31st of December, 1893, and thenceforth a retiring allowance of £400 per annum during the remainder of his life." He said that Mr. Starkey had served the department during a long life, and the Corporation for seventeen years. From the Corporation he had had no rise of salary; and the Committee were willing to treat him as a servant who in his time had done his best.

Mr. FALLOWS seconded the resolution.

Mr. BRADLEY moved, as an amendment, that the superannuation allowance be £250. The Council, he said, had never accepted the principle that a retiring official should be superannuated as a matter of course, but had held themselves free to have regard to the circumstances of each case as it arose.

Mr. DEXTER seconded the amendment; remarking that a man who earned £14 a week could put something aside against old age.

Mr. SHAMMON considered Mr. Starkey deserved the pension. He received £700 from the old Water Company; and since then there had been an enormous increase of his work. When, in face of such a growth of the department as was now impending, he offered to retire, they ought to treat him with generosity.

Mr. BALL said that the plea of generosity was trotted out whenever a highly-paid official resigned. Working men were told at every street corner to exercise the virtue of thrift. They ought to save 10 per cent. of their incomes, some people said; and this maxim ought to be brought home to highly-paid officials as well.

Mr. BEALE reminded the Council that, if they provided a superannuation fund, Mr. Starkey's allowance would be larger than that which it was proposed to make.

Alderman CLAYTON pointed out that a superannuation fund would be more expensive than the present form of voluntary superannuation, because, in order to get the accounts certified by an actuary, there would have to be paid into it year by year larger sums than would be practically required. If the Corporation had not acquired the waterworks, Mr. Starkey would have received a larger superannuation than they were proposing to give him; and he (Mr. Clayton) had always heard that the officials taken over were not to suffer. As to working men's allowances, £700 a year was paid to aged workmen by the Public Works Department alone; so that the suggestion that the Council treated one class differently from another was not warranted by the facts.

On a show of hands, the amendment was carried by 28 votes to 27.

The General Gas Lighting and Heating Company of Brussels.—At the annual general meeting of this Company on the 22nd ult., the Directors presented their usual report on the working of the undertaking. The Company possess 19 works in Belgium and other countries; and they hold shares in two—one at Carcassonne, the other at Lisbon. The total profit realized in the twelve months ending Aug. 31 last, amounted to 2,109,646 frs., as compared with 2,253,490 frs. in the preceding period. The disposable balance, after deducting the sinking fund and other charges, was 891,983 frs. After paying the statutory dividend of 25 frs. per share, and making certain allowances to the Directors and chief officers, a final dividend of 11 frs. per share was recommended; making 36 frs., or 7·2 per cent. (the same as before), and leaving 16,966 frs. to be carried forward. With regard to manufacturing operations, the quantity of coal carbonized was 90,666,904 kilos., as compared with 86,605,632 kilos. in 1890-91; the gas produced being 26,301,602 cubic metres, against 25,273,792 cubic metres. The sales were 22,659,883 cubic metres last year, and 21,813,713 cubic metres in 1890-91. There was an increase of 874,000 cubic metres in the quantity of gas sold; but the total profit fell off by 143,000 frs., owing to the dearness of coal, and more especially to the greater difficulty experienced in disposing of the residual products. For every 100 kilos. of coal carbonized, 69·60 kilos. remained as coke; the other products being 4,615,723 kilos. of tar, and 92,294 hectolitres (2,030,468 gallons) of ammoniacal liquor. The report was adopted.

The Gas Workers' Union.—A meeting of the Vauxhall branch of the Gas Workers' Union was held last Thursday night at the Eldon Street Schools. The Rev. W. A. Morris, Vicar of St. Anne's, Lambeth, presided. Mr. Pete Curran said he was glad to be able to state that the Union, in spite of the predictions of not only the capitalists but many of the older unionists, was stronger, both numerically and financially, than it was in January, 1891. There was no doubt that trade was now in a depressed state; and hence he thought the present was not the time to make any further demands, but rather to consolidate their forces in view of the time when trade should be better. He had just returned from a long tour in Ireland, where he found a deplorable falling off in the ranks of trade unionists, owing to the political partisanship which ran so high. In England, on the other hand, he claimed for the unskilled Unions that they had, during the past three years, done more to assist the workers to capture the machinery of local and Imperial government, than had been accomplished during the whole fifty years before their existence. At the same time, their Union had added about £2,000,000 sterling to the wages of their members during the past two years. He asked them to remember, however, that the addition of ½d. an hour, or even an eight-hour day, would not solve the labour question. This could only be done by bringing about the collective ownership of land and capital. Referring to the proposed British Labour Exchange (particulars of which were given in the JOURNAL last week), Mr. Curran said he was not displeased to see these efforts. The Shipping Federation and the Free Labour Exchange were failures. Such organizations did not come into existence until the rise of the New Unions; and they only indicated that the class war was coming nearer every day.

WATER AND WATER SUPPLY.

Lectures by Major Flower and Dr. Percy Frankland.

During the past year the subjects of water and water supply were much before the general public, in consequence mainly of the appointment of the Royal Commission which is now investigating the question with special reference to the Metropolis, and of the passing of the Act for carrying out the great scheme for conveying water to Birmingham from Mid-Wales. As the supply of water is a matter upon which people are not so well informed as they might be, any attempt to enlighten them thereon is worthy of recognition. We therefore notice briefly two lectures on this subject delivered towards the close of the past year by men specially qualified for imparting instruction. The first was by Major Lamorock Flower, Engineer to the Lea Conservancy, and was given at the London Institution on the 12th ult.; the second was by Dr. Percy F. Frankland, and was delivered at St. George's Hall, Langham Place, on the 18th ult.

Major Flower began by stating that his lecture would necessarily be somewhat technical; but, in order, as he said, to "make a very wet subject a little less dry," he supplemented it with some limelight illustrations. Proceeding, he pointed out that water had been considered of the greatest importance from the very earliest times; and he quoted the Bible to prove his assertion. The ancients, he said, naturally regarded the rivers as the sources of water supply; it was reserved for modern civilization to use healthy streams as the common receptacles of refuse. As an instance of the important part which water plays in the economy of Nature, it might be said that, if a man weighing 140 lbs. were placed under a hydraulic press and squeezed flat, the result would be 105 lbs. of water and only 35 lbs. of dry residue. Major Flower then gave some interesting facts about the rainfall of England. It is, of course, highest in mountainous districts; the maximum fall being found in Cumberland, where the record for six years shows an annual rainfall of 165 inches. The lowest rainfall in England is between Biggleswade and Bedford, where it reaches only 20 inches. London and the east coast average about 20 inches. Various rain-gauges were next described; and the lecturer remarked that the recording of the rainfall was an interesting hobby for anybody, and a necessity for the various county councils all over the country. With regard to water supply, from 30 to 35 gallons per head per day must be taken as the minimum which it was safe to trust to, for a considerable proportion would not reach the consumer, owing to imperfect fittings, and carelessness. Dealing with the pollution of water, Major Flower said that, to start with, rain was in reality water which had washed a more or less dirty atmosphere; and thus it was polluted from the very beginning. Vegetable pollutions were practically harmless; the refuse matter and sewage which came from populated districts being the worst. It was satisfactory to know that a balance between pollution and purification was constantly being maintained in our rivers by means of oxidation. It had been stated by an eminent authority that there was no English river long enough to oxidize the sewage which passed into it; but, though authorities might differ, the self-purification of rivers formed a very interesting subject of investigation. As far as his own experience went, there was less organic matter in the Thames at Hampton, where the Water Companies' intakes were, than at the source of the river itself. A little attention to small things would do very much for the purification of water—at any rate when the source of supply was under one's own control, such as a surface well. As for drinking water, as pure water did not exist in Nature, something had to be done to it before it could be safely consumed; but even after the most careful sedimentation and filtration, and being softened with lime, it was often contaminated on its way to the consumer. Being generally conveyed in iron pipes, it sometimes came in contact with rust or the hemp with which the pipes were caulked; and more often than not, there was a vacuum in the pipe, and noxious gases found their way into it. The latter evil, as well as that arising from dirty cisterns, might be remedied by a constant supply of water under pressure. He did not agree with the suggestion that there should be two supplies—one for drinking and cooking, and the other for sanitary purposes—not, at least, until our domestic servants were nearer perfection than they now are. The very best way to get drinking water was to bottle it at the fountain head, and have it delivered in bottles. This had been done already, and might be done to a greater extent in the future. However, while cisterns existed, the greatest care ought to be taken that they were in an easily accessible position, properly covered, and frequently cleaned.

The lecture delivered by Dr. Percy Frankland, which was entitled "The London Water Supply: A Scientific Answer to a Popular Question," although dealing largely with bacteriology, was made interesting to the general public; and, like Major Flower's, it was accompanied by numerous lantern illustrations. The lecturer commenced at a date some 300 years back, when a Dutchman—Master Peter Maurice—devised a system of obtaining a supply of water at London Bridge. He paid 10s. for the occupation of one arch, under which he constructed a water-wheel with which to supply the City. His operations subsequently extended to three arches; and eventually the undertaking was disposed of for £36,000. In 1613 the New River project was set on foot by Sir Hugh Myddelton. These were the precursors of the present system of water supply in the Metropolis, which furnished something like 200 million gallons every day, or 35 gallons for each man, woman, and child of a population of 5½ millions. Out of every 100 gallons, 54 were obtained from the Thames, 29 from the Lea, and 12 from springs and wells. Having compared the Metropolitan supply with that of other places in regard to quantity—quoting for the purpose statistics prepared by the late Sir J. Bazalgette—Dr. Frankland remarked that it was with the quality of the water that we had more especially to concern ourselves. The intimate connection between drinking water and health had been fully recognized from remote antiquity; but it had only been during the last half century that it had come to be understood how disease is communicable by water. Bacilli were now generally recognized as the cause of typhoid fever and cholera; and therefore our aim should be to destroy these organisms, which gain access to water through the discharge thereinto of the excreta of persons suffering from these diseases. In the earlier writings on this subject, the properties of

bacteria were inferred from unscientific data; but in 1886 he undertook a series of experiments to ascertain what would be the fate of bacilli in water. By means of tables thrown on the screen, Dr. Frankland showed that these organisms multiply abundantly in sewage-polluted water, but disappear in filtered water. Quoting the results obtained by Kraus, who carried out some experiments on the cholera, typhoid, and anthrax bacilli, he proved that all these in the course of time perish before the harmless bacteria in water. These creatures, he said, imposed a heavy tax on the injurious bacilli; and, where prolonged storeage was possible, the struggle for existence was lengthened, and the harmless bacteria would be victorious. Such storeage was provided in lakes and reservoirs. The lecturer then explained the processes of subsidence and filtration as carried out by the London Water Companies since the introduction of sand filtration by Mr. Simpson at the Chelsea Water-Works in 1830. This system, which had for its original object merely the clarification of the water from visible particles, had been carried out with increasing care down to the present time. It was thought that no real hygienic safeguard was provided by it. But, in 1885, he (Dr. Frankland) applied the results of bacterial science to London water; and he found that, on an average, 98 per cent. of the organisms were removed by the filtration processes in use. If storeage and filtration were properly carried out, the bacilli had little chance; without this, they would prove dangerous, as they did in the cases of the Rivers Seine and Elbe. The Seine was a highly polluted stream, and its water was not generally used for drinking purposes, except in extremely dry seasons, when it was turned into some of the poorer quarters of Paris, and an outbreak of typhoid fever usually followed. In Hamburg, water was taken from the River Elbe and used without filtration; and there was the strongest evidence that this had been the means of spreading the cholera. It was an interesting fact that Altona, a suburb of Hamburg, derived its water from the Elbe, and even from a worse part of it than did Hamburg; but it was subjected to filtration through sand. The cholera statistics of the two places were strikingly different. In Hamburg, with a population of 640,000, the deaths were 8000, and the cases 18,000, or 1250 deaths and 2912 cases per 100,000. In Altona, with a population of 143,000, the deaths were only 221 per 100,000. This difference could not be attributed to the fact that the sanitary condition of Altona was better than that of Hamburg; for while the average death-rate of the city was 23·5, that of the suburb was 25·3 —showing that, judged by this standard, it was, as a rule, rather less healthy. Typhoid was the only other cause of death attributable to water supply; and Dr. Shirley Murphy, the Medical Officer of the London County Council, had shown that London was more free from this malady than any other town in the kingdom. In conclusion, Dr. Frankland said that an inquiry into the merits of the present water supply of the Metropolis was not one to be lightly undertaken; and therefore it was a matter for congratulation that this important subject was being investigated by a Royal Commission composed of men who were thoroughly competent to deal with a question affecting the interests of the largest urban population in the world.

Christmas at the Crystal Palace District Gas-Works.—Following the custom of recent years, the Directors of the Crystal Palace District Gas Company again invited their employees to a substantial tea, which was provided in the large recreation-room of the gas-works. Owing to the number to be catered for, the men were divided into three parties of about 150 each. The first of the teas was held on Thursday, Dec. 29, and again on Jan. 3 and 5. Mr. C. Gandon, the Engineer of the Company, presided on each occasion, supported by several of the staff. The health of the Company was proposed by the Chairman, and enthusiastically received. The evenings were enlivened with music; and the healths of the Chairman and Mr. J. C. Watson were also given with musical honours.

Bilston Gas Company's Affairs.—The usual meeting of the Bilston Gas Company was held yesterday week. The Chairman (Mr. T. Holcroft), in submitting the report—which was noticed in the JOURNAL for the 27th ult.—remarked that he considered it very satisfactory that they had made a profit in the face of bad trade and the dear prices of coal, and without having to raise the price of gas. Referring to the proposal which was made about a year ago to amalgamate the Willenhall Gas Company with theirs, he said the scheme had not been proceeded with; and it had not cost the shareholders anything. He also mentioned that, in order to protect the gasholders, the Directors had purchased the mines underneath the works; and the Great Western Railway Company had contributed £400 towards the cost, as the mines also underlay their lines. The report was unanimously adopted.

Electric Lighting in Theatres.—"A Chilly Playgoer" writes to the *Daily News* on this subject, as follows: "When the electric light was first used for illuminating the interiors of theatres, it was hailed with delight by myself in common with most other playgoers. Experience, however, has abated much of my enthusiasm. The fact is the electric light, with its infinitesimal power of radiating heat, and its freedom from contaminating influences on the atmosphere, is a very great boon in summer weather, but the very reverse in winter time. This arises from the fact that no London manager will warm his house during the inclement season. Why this should be so, I really do not know. My club-house, like most other large buildings, is made nice and comfortable with hot-water pipes; and at my suburban residence I have a good fire blazing on the hearth. It is only at the theatre that I am expected to sit still when the thermometer is not so very many degrees above zero, with no artificial warmth other than that afforded by my clothing. In large theatres, like Drury Lane and Covent Garden, matters are complicated by the fact that, as long as the curtain is up, icy volumes of air sweep down upon the audience, who sit in shawls and comforters and overcoats tightly buttoned up round the throat. It is stated, on apparently good authority, that the present Christmas season has been the worst that managers have experienced for many years. Let them take steps to make their play-houses habitable, and then, having called public attention to the fact that they have done so, let them wait and watch the result."

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Last year the Corporation of Glasgow advanced the price of gas from 2s. 6d. to 2s. 9d. per 1000 cubic feet, in order to wipe out the large deficit of £26,139. Their object may be attained by decreased expenditure; but, as I daresay was expected, it is not likely to be by increase of business. In fact, the inevitable has happened—the rise in the price of gas has affected the revenue. Fully seven months of the financial year have elapsed; and the gas-rental in that time has amounted to £114,478, as compared with £115,036 in the same period of the preceding year—a decrease of £557. The end of December was very foggy; and this helped to bring the decrease down, for at the middle of the month it was as large as £3809. A continuance of dark weather would soon wipe out all that remains, and send the balance up on the right side; but, on the other hand, clear weather would, before May arrives, add to the decrease. The Gas Trust are also unfortunate in their residuals account, the revenue in which has been for the current year £37,545, as compared with £47,390 in the same period last year—a decrease of £9845. I must confess the outlook is not very cheering. Taken over all, the Trust cannot expect to be able to report a reduction in the price of coal of much more than 1s. per ton, and probably not so much. On the quantity of coal consumed last year, a saving of 1s. per ton would produce only about £23,000; so that other £3000 would have to be derived from somewhere else. It is evident that, instead of its being got from residuals, savings will have to be effected by other means to make up the loss upon them. It is a long way to look ahead; but, as matters stand at present, the prospect is rather of a raising of the price of gas next summer than a lowering of it.

Mystery deepens as one comes to know more of that famous deputation from the Edinburgh Town Council to the electric lighting works of the South. The deputation are in the throes of preparing their report upon what they saw and learned. They sat for several hours one day this week, and adjourned without completing it. What is the difficulty? They have received information which they are not permitted to make use of. In some of the works which they visited, they were admitted upon sufferance—the condition being imposed that they would not publish certain things which were communicated to them. The reason for this is that certain engineers are jealous of their neighbours, and endeavour to keep them in the dark as to what they themselves are doing—a feeling which I am amazed to hear exists, because of the assumption accompanying it that a neighbour would act otherwise than honourably were he to find out how a certain engineer worked his system. I have hitherto regarded the electric lighting enterprise as one in which there was a great amount of solidarity; but this incident throws a side-light upon the doings of the fraternity who are engaged in it, and shows them to be each fighting fiercely "for his own hand." A brotherhood which is so veiled does not convey to an outsider the impression that they are engaged in an industry of a very healthful nature. The effect, so far as the Edinburgh deputation is concerned, is that they have been going around to try and pick up information; that they have obtained the information, but cannot use it; and that the councillors who were not on the deputation, and the citizens generally, not having the secret information before them, will have to accept the conclusions of the deputation as they are presented. But more extraordinary still, I understand that the deputation are not to recommend any particular system, but are to lay before the Council the information they have received, and ask power to call in a superior expert to advise them which to adopt. Upon what is he to proceed, if all the knowledge which the deputation have is not put before him? If he be a person unconnected with any of the works they visited, he will make up his mind upon incomplete information; and if he be connected with any of them, he will, of course, recommend his own system. In that case, why call him in as an expert to advise upon all the systems examined? Why not adopt his system at once, and ask him to prepare plans and specifications? If he is to be really an expert, he should have all the information before him which the deputation have; while if he be not in that position, he should not be in the capacity of expert, but in that of a servant. Perhaps it is here that the services of Mr. Murray, of Biggar, who accompanied the deputation as expert clerk, will come in. Of course, he has all the information, and if he is at liberty to give it to the superior man who is consulted, the community of Edinburgh, whose interest is at stake, will benefit by his appointment. In that case, what would become of the precaution of making certain information secret? The deputation seem to have gone into their work with vigour, for they not only looked at works, but interviewed customers as to their experiences. What is of interest at present is that, before starting, they seem to have been aware that they would not voluntarily receive all the assistance which they desired, and to have taken means to ensure that they would not be thwarted. Whether, now that they appear to have gained their end, they can use to their advantage the information they have got remains to be seen. The incident illustrates, on the one hand, the futility of sending deputations from public bodies to inquire into private businesses; and, on the other, the unsettled and unsatisfactory position of the electric lighting industry, when, while making a show of being frank and open, subterfuge has to be resorted to by its exponents. It also shows that electric lighting has not, in the course of its history of about 20 years, become one of the public agencies in civilization, but is still matter of individual speculation both on its scientific and on its financial side. It is so far from having been tried and found efficient, that its promoters shrink from allowing it to be tested openly; and those who adopt it, have really to take a leap in the dark.

At the Aberdeen Town Council on Tuesday, Treasurer Bisset moved his motion for a remit to the Gas Committee to consider and report as to whether it would be to the advantage of the Corporation to have a steamer built for the purpose of carrying the coal brought by sea in connection with the gas undertaking. The remit was agreed to. The Treasurer's reasons were: (1) That he saw so many unemployed men in the shipbuilding trades; (2) that, from his experience as a trustee,

he was convinced, notwithstanding the great outcry among shipowners, that a steamer could be made to pay; and (3) that at present they paid from 5s. to 6s. 6d. per ton for land carriage, and coal could be brought by sea for about one-third of that sum. He did not propose that anything should be done until they fixed their next contracts, when they might be able to arrange for more coal being carried by sea. Now it is to be observed that the proposal is that a steamer is "to be built," for the benefit of the unemployed. That is not sound policy; it is a species of Municipal Socialism which should not be lightly entered upon, because, if conceded to shipbuilding trades, it would have to be extended to others also, when occasion required. His second reason would not hold good if constant employment were not given; and as to his third, the total savings would depend upon the total quantity of coal which the Corporation could transfer from land to sea carriage. But if it be possible to transfer a large quantity in that way, the carriage could be done by contract; and there would then be no need for the Corporation entering upon the risks of shipowning.

Mr. George F. Allan, who headed the opposition to the Directors at the recent meeting of the North British Water-Gas Syndicate, has issued a circular to the shareholders, stating that the Committee of the dissenting proprietors had decided, if supported by the majority of the shareholders, to oppose any further calls, and to decline the proposed amalgamation with the British Water-Gas Syndicate and the Yorkshire and Lancashire Water-Gas Company.

The Hamilton Town Council have got over, in a way which is quite satisfactory, the extraordinary discovery of a large connection with the gas-mains without a meter, in the premises of one of their number. In a report by the Gas Committee to the Council, submitted at a meeting on Thursday, they stated that, having heard evidence, they were willing to believe that the owner of the premises had no intention of injuring the Corporation; but they recommended that orders should be given for a complete overhaul of the gas pipes and fittings for the public security, and to the satisfaction of the Manager. The gentleman referred to read a statement in which he demanded an apology from the Gas Committee "for the bitter things their Convener said at the last meeting;" and he submitted a certificate from his tenants, to the effect that they had not, during the 23 years they occupied the place as a carriage show-room, used any gas at all in it. He held that no landlord could be made responsible for the irregularities of his tenants, who generally attached their own fittings. The Convener of the Gas Committee explained that the trouble arose because the owner of the premises had had the gas-pipes fitted up under his own supervision; and he asked where they would be if everyone were to do the same. The Council adopted the report of the Committee; adding to it a statement that they believed the owner had personally burned no gas in the building since 1869.

The good effect of improved plant has been exemplified in the working of the Hamilton Corporation Gas-Works. Last summer, a retort-bench was reconstructed on the principle adopted by Mr. Henderson, of Saltcoats, and the Convener of the Gas Commissioners, reporting on Thursday, stated that the average number of retorts in use had been reduced from 57 to 44; that during the past month the quantity of coal used was 1016 tons, as compared with 1114 in December, 1891; and that, notwithstanding the smaller quantity of coal used, the output of gas last month was 10,331,000 cubic feet, as against 9,219,000 cubic feet in December, 1891. The gas supplied last month was of 27·24-candle power; and the cost of production was 15¾d. per 1000 feet.

I omitted to mention last week that, on the evening of Friday, the 30th of December, the mechanics of the Edinburgh and Leith Gas Commission, at the Edinburgh works, held their annual supper in the Royal Exchange Hotel. A company of about 50 were present. Mr. D. Alexander, the Superintendent of the Works, presided, and Mr. R. Mitchell, the Engineer, looked in in the course of the evening, and made a few remarks. A very pleasant evening was spent.

The Taunton Electric Lighting Scheme.—According to the *Electrical Review*, the result of the recent inquiry by Sir T. W. P. Blomefield and Major Cardew into the application by the Taunton Corporation for authority to acquire the undertaking of the Taunton Electric Light Company, has been a favourable report to the Board of Trade, who have granted the necessary Licence.

The Charge of Obtaining Subscriptions for a Gas and Water League.—Last Friday, Mr. Gedge Long Cobden, described as Chairman of the Gas and Water League, residing at Newton Road, Bayswater, surrendered at the Westminster Police Court to his recognizances to further answer the charge of obtaining 1s. by false pretences from Sidney Klosz, chemist, of 19, King's Road, Chelsea. Mr. E. H. Baker appeared for the defendant, who, it will be recollected, personally solicited signatures to a petition which was to be presented to Parliament to carry out the objects of the League. A subscription towards the expenses was also asked for; and it was suggested by the police that the collection of money from the public had gone on for a long period. Mr. Baker said the defendant was carrying on a *bonâ fide* public movement, and that Sir Charles Dilke, M.P., had promised to present his petition in the coming session. On the previous Friday a remand was taken for the Treasury to decide whether or not they would undertake the prosecution. Mr. Baker mentioned that he was prepared with evidence for the defence. Mr. De Rutzen, addressing the defendant, said the case had been under careful consideration; but, inasmuch as the defendant's practices had been going on for something like 18 years, they were very difficult to deal with. In consequence, he was going to discharge him; and he hoped the attention of the public had been sufficiently drawn to the matter to put a stop to the course which defendant had so long pursued. He would refrain from saying any more, because some day other steps might be taken in the matter. Mr. Baker said he could assure his Worship that a good deal might be said for the defendant. Mr. De Rutzen: "Oh, yes; perhaps it is as well to leave it as it is. I have refrained from saying a good deal." Mr. Baker said he had a great many rolls of *bona fide* signatures obtained by the defendant to his petitions. The accused was then discharged.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Jan.* 7.

Sulphate of Ammonia.—The market has taken a decided turn for the better; and values are improving steadily. £10 2s. 6d. has been paid f.o.b. Hull and Liverpool; and, as there is little offering, a further advance is within the bounds of probability. Nitrate is also firmer.

LONDON, *Jan.* 7.

Tar Products.—The improvement noticeable in some of the tar products is maintained; and a steady business is being done. The severe weather has had its effect both on production and deliveries; but this does not appear to have had any weakening effect on prices. Carbolic and cresylic acids are in good demand, both for prompt and forward delivery; and the outlook for these articles is very hopeful. Higher prices are being asked for benzols; and considerable business is being done, although whether for speculation or for consumption it seems difficult to say. Pitch is well inquired for, and maintains its price. Anthracene is also firm at the prices quoted. Prices are as follows: Tar, 11s. 6d. to 12s. 6d. Pitch, 28s. 6d. Benzols, 90's, 2s. 1½d.; 50's, 1s. 9½d. Toluol, 1s. 4½d. Solvent naphtha, 1s. 3d. Crude benzol naphtha, 30 per cent., 9½d. Creosote, 1¼d. Creosote salts, 20s. Carbolic acid, 60's, 2s. 2d.; 70's, 2s. 5d.; crystals, 8d. Cresol, 1s. 9d. Anthracene, 30 per cent., "A," 1s.; "B," 9d.

Sulphate of Ammonia is in better demand, especially for later delivery; and the price ranges from £10 2s. 6d. to £10 5s., less 3¼ per cent. Gas liquor is quoted at 6s. to 7s. per ton.

COAL TRADE REPORTS.

Lancashire Coal Trade.—Except a fairly brisk demand for the better qualities of round coal, suitable for house-fire purposes, there is only a moderate business doing in the coal trade of this district. For these, prices remain firm at fully late rates; but there is no indication of any movement at all in an upward direction. Common round coals continue very bad to sell; and supplies of these continue largely in excess of requirements, either for inland consumption or shipment—surplus quantities being pushed upon the market at excessively low figures. At the pit mouth, steam and forge coals only in exceptional cases average more than 7s. per ton; while for shipment, common steam coal is offered freely at about 8s. 3d. per ton, delivered at the ports on the Mersey—although better qualities are not actually quoted under 8s. 6d. to 8s. 9d. per ton. Engine classes still meet with a fairly ready sale, and rates are well maintained. Prices average 6s. 3d. to 6s. 9d. for burgy; 4s. 9d. to 5s. 3d. for best qualities of slack; 4s. to 4s. 6d. for medium; and 3s. 6d. for common sorts, at the pit mouth.

Northern Coal Trade.—There has been a rather better demand for coal during the last few days—the stocks having been depleted during the holiday period, and the consumption both of gas and household coals having been extremely heavy. Still, the production is also very large; and the needs of users have been met without any great pressure. Best Northumbrian steam coal has been slightly weaker in price; but about 9s. per ton f.o.b. is still the current quotation—second qualities being 9d. per ton lower. For small steam coals, about 3s. 6d. per ton is the current quotation. Prices of best Durham gas coals are still 7s. per ton for odd cargoes; but large contracts have now begun to run at lower prices, and deliveries on these are now so heavy that the average price received will be limited. Bunker and manufacturing coals are weaker. Coke is steady, on the basis of about 15s. per ton f.o.b. Gas coke is in large supply, and is rather quieter; but as the output will now be reduced, it may be expected that current prices will be retained for some time.

Scotch Coal Trade.—Last year was an active one in the Scotch coal trade. It is now possible to give the exports for the whole year, which is a very good index of the amount of work going. During 1891 these amounted to 6,738,703 tons; and in 1892, to 7,764,417 tons. There was thus an increase during the twelve months of 1,025,714 tons. For the last week of the year they amounted to 123,445 tons—which was a decrease, owing to the holidays, of 30,057 tons upon the preceding six days, but an increase of 19,554 tons upon the corresponding week of 1891. The year was not, however, a good one in respect of either prices or wages. A year ago the prices ruling were: Main, 8s.; ell, 9s. to 9s. 3d.; splint, 9s. to 9s. 3d.; and steam, 10s. 6d. to 10s. 9d. per ton. They are now: Main, 6s. 9d. to 7s.; ell, 7s. 9d.; splint, 7s. 9d.; and steam, 8s. 9d. to 9s. per ton. The miners' wages have also fallen by about 25 per cent. During the past week, trade has been practically at a standstill. The prospect is a further reduction.

The North British Water-Gas Syndicate.—The Glasgow dissentient shareholders of the North British Water-Gas Syndicate intimated to the Glasgow Directors last Friday that they will hold them responsible if they deliver the balance in hand of £12,000 to the parent body.

The Dispute at the Bolton Gas-Works.—Our Bolton correspondent says that the threatened dispute between the Bolton Corporation Gas Committee and the stokers, referred to in the JOURNAL last week, has been amicably settled; the former offering, and the men accepting, two days' pay for Christmas Day, instead of the 2½ days claimed.

The Cost of the New Purifying Plant at the Dukinfield Gas-Works.—At the meeting of the Dukinfield Local Board on Monday last week, Mr. W. Kerfoot gave some particulars as to the cost of the new purifying plant. He stated that the outlay for the purifier-house and meter-house, including the pulling down of old buildings, &c., was £797 18s. 8d.; and the amount yet due, £120. The cost of the oxygen purifiers, &c., and all labour and materials, was £1375 1s. 1d.; and the amount still due, £378. The cost of the purifier-valves, connections, &c., was £942 4s. 6d.; and the amount still due, £176 10s. The expenditure on sheds (£70 19s. 10d.) made a total of £3680 14s. 1d. This figure was as near as they could possibly get at present; and he thought it would include all costs. Whether the Brin oxygen system proved to be as successful as had been anticipated, remained to be seen; but so far as the purifiers were concerned, they would last for many years.

The Railway Siding at the Bury Gas-Works.—The Bury Town Council decided last Thursday to apply to the Local Government Board for power to borrow £15,000 to complete the railway siding to the gas-works. The total cost as now estimated will be nearly £42,000, and the borrowing powers so far granted are for a sum of £25,000.

The Electric Lighting of South Kensington.—A provisional agreement has been entered into, subject to confirmation by Parliament, by which the Chelsea Electricity Supply Company agree to sell to the Kensington and Knightsbridge Electric Lighting Company all the rights and powers obtained by them in 1889 for the electric lighting of South Kensington. The sum to be paid by the Kensington and Knightsbridge Company for these rights is £7000; and the transfer is to take place within one month after the agreement has received confirmation by Parliament.

Explosion of a Gas-Meter at Blackburn.—Last Tuesday, three men who are employed in the Gas Department of the Blackburn Corporation, had a narrow escape from death by the explosion of a gas-meter, which they had fixed in the winding-room of the Britannia Mill. The men were engaged in drilling the service-pipe for the insertion of a bye-pass; a light being held a short distance away. On the gas issuing from the hole coming in contact with the light, an explosion took place—the meter being smashed into fragments. One of the men was rendered unconscious; but most miraculously the others escaped almost unhurt. The damage to the property is said to have been considerable.

A Pleasant Entertainment at the Colchester Gas-Works.—Mr. H. S. Pike, the Engineer of the Colchester Gas Company, entertained the officials and employees, together with their wives, at the gas-works last Thursday week. Part of the new coal-shed, which was very prettily decorated, was utilized for the occasion. Early in the evening, the guests, numbering about 150, sat down to a substantial tea, and afterwards they were treated to a display of dissolving views, the whole of the apparatus being most successfully managed by Mr. Pike, who described, among many others, various magnificent photographs of scenes in North Wales and the Paris Exhibition of 1878. At intervals some capital songs were rendered by gentlemen present; and the proceedings concluded with a hearty vote of thanks to Mr. Pike for his kind entertainment.

The Local Government Board and Gas-Works Loans.—Intimation has been received at Rochdale that the Local Government Board will only allow a period of 30 years for repayment of the proposed loan for the extension of the gas-works. The Corporation wish to borrow £65,000 for improvements which are greatly needed; and in their application they suggested that the repayment of this sum should be spread over 75 years. The Inspector who held the inquiry intimated that the wishes of the Corporation were not likely to be acceded to; and his opinion is now confirmed. To repay the money in the shorter period will, it is said, necessitate the setting aside of an additional annual sum equal to a rate of 1d. in the pound. In the meantime, the consumption of gas shows a very gratifying increase. Since the end of the financial year in March last, there has been an increase of about 5,000,000 cubic feet in the production.

Additional Water-Works for Morpeth.—On Tuesday last, Mr. R. Walton, M.Inst.C.E., one of the Inspectors of the Local Government Board, held an inquiry at Morpeth respecting the application made by the Town Council for leave to borrow £5000 for increasing the water supply. The Engineer (Mr. Dinning, of South Shields) produced the plans for the proposed additional works; and from the statement he made, it appeared that a reservoir is to be constructed close to the existing storeage reservoir at Tranwell, so that the surplus water will be collected in the new reservoir after passing through a settling-well and filter-bed. The level of the reservoir will be several feet lower than that of the present one. With the view of obtaining a sufficient pressure to supply the higher portions of the town, the water from the new reservoir will be carried direct to the town. At the close of the proceedings, Mr. Walton visited the proposed site of the reservoir, and went over the gathering-ground.

Bursting of a Large Water-Main at Newcastle.—A flood, the like of which has probably never been witnessed in Newcastle, occurred last Saturday week in Rye Hill; the cause being the bursting of one of the large mains belonging to the Newcastle and Gateshead Water Company. The gardens and basements of the houses on the east side of the street were inundated, several large flags and stone steps were torn up, and altogether considerable damage was done. The Water Company were soon apprised of the occurrence, and several of their men were on the spot as promptly as possible. There was great difficulty, however, in dealing with so serious a break; and it was at least two hours after the commencement before the torrent could be stopped. It is impossible to calculate, with any degree of correctness, the quantity of water lost; but it must have amounted to millions of gallons. On the following day the damaged pipe was removed, and a new one laid. The injury to property, furniture, and goods was very great; and the cost of restoration will certainly amount to an exceedingly heavy sum.

Colonial Gas Undertakings.—According to the report of the Directors of the Grafton (N.S.W.) Lighting Company, Limited, for the six months ending Sept. 30 last, the profits realized amounted to £560. Adding to this the £42 undivided balance, made a total of £602 available for division. This was disposed of as follows: Dividend at the rate of 8 per cent. per annum, £320; reserve and depreciation funds, £150; carried forward, £132. The Manager and Secretary (Mr. H. Hoare) reports the plant in good order, and the consumption of gas steadily increasing. The Directors of the Charters Towers Gas Company, in their eleventh half-yearly report, which covers the six months ending Oct. 31 last, state that the consumption of gas is increasing; 5,415,600 cubic feet having been sold, as compared with 4,027,300 cubic feet in the corresponding period of 1891—an advance of 1,388,300 cubic feet. The Company's mains are being largely extended; and when this work is finished, additional consumers will be secured. The works have been maintained in an efficient state; and it is satisfactory to find that nearly all the extensions to the plant which have lately been carried out have been paid for out of the profits.

A New Water Scheme for Darton.—On behalf of the Local Government Board, Mr. R. Walton, M.Inst.C.E., held an inquiry at Darton last Wednesday into an application by the Local Board to borrow £7000 for purposes of water supply. Darton at present draws its supply from Barnsley, but having had notice that it might not be continued, the Local Authority entered into negotiations with the Penistone Local Board, and a supply had been arranged for at 8d. per 1000 gallons or less, according to the quantity consumed. The pipe-lines and service reservoirs required will cost £7000. There was no opposition to the proposals. The Penistone Board intend borrowing £3000 for additional pumping apparatus to meet the demands of Darton.

The Goole Gas and Water Company's Bill.—A special meeting of the shareholders of the Goole Gas and Water Company was held last Thursday for the purpose of sanctioning the application to Parliament for additional powers for the extension of the gas and water works. The Chairman (Mr. Percy Tew) explained that the water supply of the town was fast decreasing, and stated that the engine at the pumping-station was now working 23½ hours out of the 24. The water supply would soon be exhausted; and he urged the shareholders to give their support to the Bill in this respect, and also for the erection of new gas-works at Rawcliffe Bridge. Mr. Maude seconded the proposition. A vote was then taken, when the holders of about 3000 shares voted in favour of the Bill; and Mr. R. Hickman, on behalf of the Local Board (representing 2000 shares) voted against it. As three-quarters of the shares were required to carry the resolution, the Company cannot at present proceed in the matter.

Liability for Arrears of Water-Rates.—In the City of London Court, Mr. Commissioner Kerr on Monday last week decided a case in which the East London Water Company sought to recover the sum of £8 5s. for the water-rate due in respect of several small houses in Tylney Road and Godwin Road, Forest Gate, of which the defendant is the owner. Mr. Norris, for the defendant, said he did not dispute the water-rate due since his client had been the owner. But he had only recently acquired the property; and the Company wanted to make him pay for the arrears due when he took possession. This was anomalous. Mr. G. Kebbell, the Company's Solicitor, said that, when houses were let at annual rents of below £20, as in this case, the Company could not cut off the supply if the tenant did not pay it. But Parliament had provided that, when the tenant did not pay, the man who collected the rents should be deemed to be the owner, and that he should be held liable, not only for the water-rate due, but for all the arrears attaching to the property when he began to collect the rents. Mr. Commissioner Kerr said that this was so. Mr. Norris thought it very hard upon the owners of small property. Mr. Commissioner Kerr agreed; but he said it was the law. He must find for the plaintiffs, with costs.

The Lewes Gas Company and the Corporation.—The street lighting of Lewes (says the *East Sussex News*) engaged a good deal of attention at last Wednesday's meeting of the Town Council. Not long since a new arrangement was come to with the Gas Company, whereby meters were to be attached to some of the street gas-lamps, and payment made for the whole by taking an average of the consumption which these meters, situated in various parts of the town, indicated, Soon after this new plan was adopted, the Directors of the Gas Company entertained the absurd notion that some of the meter lamps were either not lighted, or turned out at a much earlier period than the others; thereby greatly reducing the average of the whole. Who they thought could be mean enough to do such a thing, or how it could possibly be done, without becoming a matter of public notoriety, has not transpired. However, acting on a clause in the agreement with the Corporation, which gave the Gas Company power to put down not less than a certain number of meters, they decided to attach a meter to every lamp, and charge the Corporation a yearly rental for each, as well as the gas shown to be burnt. The members of the Corporation, doubtless incensed by the slur of attempted imposition cast upon them, and in view of the extra cost of the meters, set about finding some way to checkmate the Gas Company. This they have succeeded in doing, by deciding not to light the lamps on moonlight nights, and to curtail the consumption of gas in every possible way. As the Directors of the Gas Company profess that they are supplying the town with an illuminant at about cost price, most people would have thought the last arrangement quite in accordance with their views. But this does not seem to suit them all. Probably they looked to making a much larger profit out of the town, by putting down these extra meters; but they seem to have been foiled in the efforts.

The Increase in the Price of Gas at Stockport.—The members of the Stockport Town Council had under consideration last Wednesday the following resolution passed by the Gas Committee regarding the advance in the charge for gas: "That, in consequence of the decrease in the price of residuals (tar and ammonia water) sold by this Committee representing a loss upon the year's production of £4400, in addition to a previous increase of wages, amounting to over 1d. per 1000 cubic feet of gas sold, or £1750 per annum (consequent upon the change from twelve to eight hour shifts in the retort-houses), the price of gas be advanced 2d. per 1000 cubic feet as from Dec. 25, making the price 2s. 8d. per 1000 cubic feet within the borough, and 3s. 2d. per 1000 cubic feet without the borough." In moving the adoption of the resolution, Mr. J. Noden said the Committee would have been delighted to avoid the necessity for bringing forward such an unpopular and objectionable recommendation; but circumstances had been too strong for them. He thought the Committee would be able to convince the public that the small advance proposed was not only reasonable but almost imperative. He read a list of 32 Lancashire towns in which the present average price was 2s. 9d., and in eleven of which there had been advances during the past two years. They had obtained returns from 110 of the principal towns in the kingdom; and the average price in these was 2s. 8d. The addition of 2d. to the charge for gas within and without the borough would bring in £3600 per annum. Considerable discussion ensued; and an amendment was moved and seconded that the resolution be referred back to the Committee for further consideration. The resolution was, however, carried with only two dissentients. Some interesting particulars were given by Mr. Noden in the course of his remarks, to which we hope to be able to devote further space in next week's issue.

The Dangers of Paraffin Lamps.—Owing, it is reported, to the accidental overturning of a paraffin lamp, the extensive premises of the Electric Lead Works, at Deptford, were set on fire on Monday morning last week; and in a short time a serious conflagration was in progress. The flames were not checked until two buildings had been severely damaged.

The New Water Scheme for Gainsborough.—The recommendation of the Water Committee of the Gainsborough Local Board, that a well 250 feet deep should be constructed, at a cost of £8000, for the water supply of the town (as recorded in our issue for the 27th ult.) was adopted at a meeting of the Board on Monday of last week. Instructions were given for the preparation of plans, specifications, &c., and that steps be taken to apply to the Local Government Board for the necessary loan.

The Lighting of Ogmore Valley (Glam.).—Until some three or four years ago, the Ogmore Valley was in a state of profound darkness; the public streets and roads being entirely without light. Then 108 paraffin lamps were provided by the Local Board. These, however, proved very unsatisfactory on windy nights; and as no other illuminant than paraffin was available for business places, it was felt desirable that some better means of lighting should be provided. A company was accordingly formed, with a capital of £10,000, to carry out an electric lighting installation. This has been done; and on the 19th ult., 144 public and a great number of private lamps were lighted for the first time. The present capacity of the plant is about 700 lights; but there is some talk of making an addition to the motive power during this year.

The Water Question at Chatham.—The Mayor of Rochester presided over a meeting held last Wednesday, when the Corporation's Bill to acquire the Brompton, Chatham, and Rochester Water Company's undertaking (an opposition scheme to the one put forward by the Chatham authorities) was discussed, together with the question whether it would not be best for the Corporation to apply for powers for the enlargement of the works at Strood, so as to obtain the whole of the city's water supply from that place. It was resolved to authorize the Corporation to proceed with the Bill. During the discussion, it transpired that a conference is to be held between the Chatham and Rochester authorities with a view to coming to terms without fighting the question through a Parliamentary Committee. The Gillingham Local Board have resolved to go on with their opposition to the Bills of both Corporations, unless admitted as joint purchasers.

The Extension of the Wigan Gas Works.—At a recent meeting of the Wigan Corporation Gas Committee, the Chairman (Mr. Holmes) reported that a deputation had waited upon Sir Hugh Owen, Secretary to the Local Government Board, and explained to him the reasons which caused the Corporation to incur expenditure on gas capital account in excess of the borrowing powers of the Corporation. After discussing the matter, Sir Hugh Owen stated that the Local Government Board felt, as the Corporation must feel, that the state of things which had existed for the past few years was very unsatisfactory, but that the Board had no desire to cripple the work of the Corporation, and that the Corporation might expend such further moneys as were absolutely necessary for continuing and extending the supply of gas in the district, provided the Council would give an undertaking to the Local Government Board that the Corporation would only incur such outlay on capital account as might be absolutely necessary for the purpose of keeping the supply of gas equal to the demand, until the Provisional Order conferring further borrowing powers had received the Royal Assent, and that thereupon the Corporation would forthwith apply for the sanction of the Local Government Board to the borrowing of the sums so expended. It was decided to recommend the Council to give the undertaking asked for.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 51.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	14 Oct.	10½	Alliance & Dublin 10 p. c.	10	16—17	..	6 3 6
100,000	10	,,	7½	Do. 7 p. c.	10	11—12	..	6 5 0
300,000	100	3 Jan.	5	Australian (Sydney) 5 % Deb.	100	104-106*	+1½	4 14 2
100,000	20	30 Nov.	8	Bahia, Limited	20	11—12	..	13 6 8
200,000	5	16 Nov.	7½	Bombay, Limited	5	5⅞—6⅛	..	6 0 0
40,000	5	,,	7½	Do. New	4	4—4¼	..	6 13 4
380,000	Stck.	12 Aug.	12½	Brentford Consolidated	100	212—217	..	5 12 10
150,000	,,	,,	9½	Do. New	100	163—168	..	5 10 1
220,000	20	15 Sept.	11½	Brighton & Hove Original	20	40—42	..	5 9 6
888,500	Stck.	31 Aug.	5	Bristol	100	103—106	..	4 14 4
320,000	20	29 Sept	11½	British	20	41—43	..	5 6 11
50,000	10	31 Aug.	11½	Bromley, Ordinary 10 p. c.	10	19—20	..	5 15 0
51,510	10	,,	8½	Do. 7 p. c.	10	14¾—15½	..	5 9 8
328,750	10	—	—	Buenos Ayres (New) Limited	10	7⅞—8⅛	..	—
200,000	100	3 Jan.	6	Do. 6 p. c. Deb.	100	93-101*	+2	5 18 10
150,000	20	12 Aug.	8	Cagliari, Limited	20	25—27	..	5 18 6
550,000	Stck.	14 Oct.	13	Commercial, Old Stock	100	232—237	..	5 9 9
165,000	,,	,,	10	Do. New do.	100	180—185	..	5 8 1
160,762	,,	15 Dec.	4½	Do. 4½ p. c. Deb. do.	100	120—125	..	3 12 10
800,000	Stck.	15 Dec	13	Continental Union, Limited	100	222—227	+2	5 14 6
200,000	,,	,,	10	Do. 7 p. c. Pref	100	187—192	..	5 4 2
75,000	Stck.	15 Sept.	10	Crystal Palace District	100	185—190	..	5 5 3
486,090	10	28 July	10	European, Limited	10	19½—20½	..	4 17 7
354,060	10	,,	10	Do. Partly paid	7½	14—15	..	5 0 0
5,470,820	Stck.	12 Aug.	12	Gaslight & Coke, A, Ordinary	100	223—227	+2	5 6 9
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	95—98	..	4 1 7
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	260—265	..	3 15 6
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	116—121	..	4 2 7
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	166—171	..	4 7 8
1,300,000	,,	,,	7	Do. H, 7 p. c. max	100	161—166	..	4 4 3
463,000	,,	,,	10	Do. I, 10 p. c. Prf.	100	258—263	+1	3 16 1
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	100	152—156	..	3 16 11
1,061,150	,,	15 Dec.	4	Do. 4 p. c. Deb. Stk.	100	117—120	..	3 6 8
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	123—128	+2	3 10 4
908,000	,,	,,	6	Do. 6 p. c. do	100	165—170	+2	3 10 6
3,800,000	Stck.	16 Nov.	12	Imperial Continental	100	220—225	+1½	5 6 8
75,000	5	30 Nov.	6	Malta & Mediterranean, Ltd.	5	4—4½	..	6 13 4
560,000	100	1 Oct.	5	Met. of Melbourne, 5p. c. Deb.	100	107—109	..	4 11 9
541,920	20	16 Nov.	5	Monte Video, Limited	20	14¾—15½	..	6 9 0
150,000	5	30 Nov.	10	Oriental, Limited	5	8—8½	..	5 17 8
60,000	5	29 Sept.	7	Ottoman, Limited	5	4—4½	..	7 7 4
166,870	10	—	2	Pará Limited	10	2—2½	..	—
420,000	100	2 Nov.	6	People's Gas of Chicago—1st Mtg. Bds.	100	103—107	..	5 12 1
500,000	100	1 Dec.	6	2nd Do.	100	100-105	..	5 14 3
150,000	10	—	10	San Paulo, Limited	10	8¾—9½	..	—
500,000	Stck.	31 Aug.	15½	South Metropolitan, A Stock	100	288—293	..	5 5 9
1,350,000	,,	,,	12	Do. B do.	100	235—239	..	5 0 5
230,000	,,	,,	13	Do. C do.	100	245—250	..	5 4 0
725,000	,,	14 July	5	Do. 5 p. c. Deb. Stk.	100	140—144	..	3 9 6
60,000	Stck.	31 Aug.	11½	Tottenham & Edm'nton, "A"	100	225—230	..	5 0 0
				WATER COMPANIES.				
744,897	Stck.	30 Dec.	10	Chelsea, Ordinary	100	245-250*	..	4 0 0
1,720,252	Stck.	14 Oct.	8	East London, Ordinary	100	203—207	+1	3 17 4
544,440	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	141-144*	..	3 2 6
700,000	50	15 Dec.	8½	Grand Junction	50	104—108	..	3 18 8
708,000	Stck.	12 Aug.	11	Kent	100	275—280	..	3 18 7
1,043,800	100	30 Dec.	9½	Lambeth, 10 p. c. max.	100	219-224*	+2	4 4 9
406,200	100	,,	7½	Do. 7½ p. c. max.	100	190-195*	+1½	3 16 11
285,000	Stck.	29 Sept.	4	Do. 4 p. c. Deb. Stk.	100	123—128	..	3 2 6
500,000	100	12 Aug.	12½	New River, New Shares	100	325—330	..	3 13 6
1,000,000	Stck.	28 July	4	Do. 4 p. c. Deb. Stk	100	132—135	..	2 19 8
902,300	Stck.	15 Dec.	6½	S'thwk & V'xhall, 10p. c. max.	100	153—158	+5	4 2 3
126,500	100	,,	6½	Do. D 7½ p. c. do.	100	135—140	..	4 12 10
1,155,066	Stck.	15 Dec.	10	West Middlesex	100	240—245	+3	4 1 7

*Ex Div.

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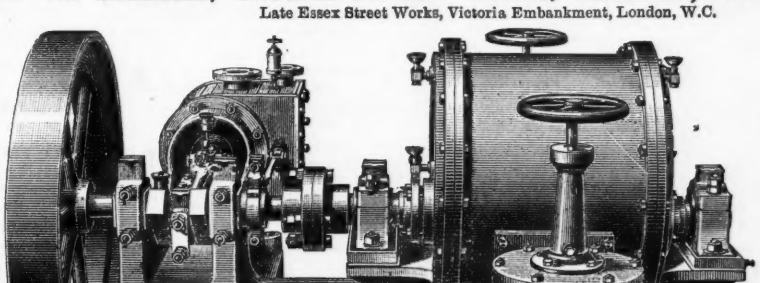

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Gas-Works, Colne,
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Tenders to be received not later than the 12th of January.

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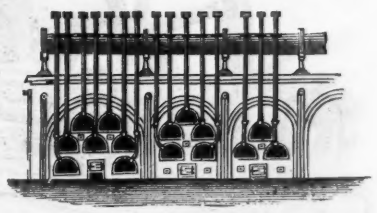

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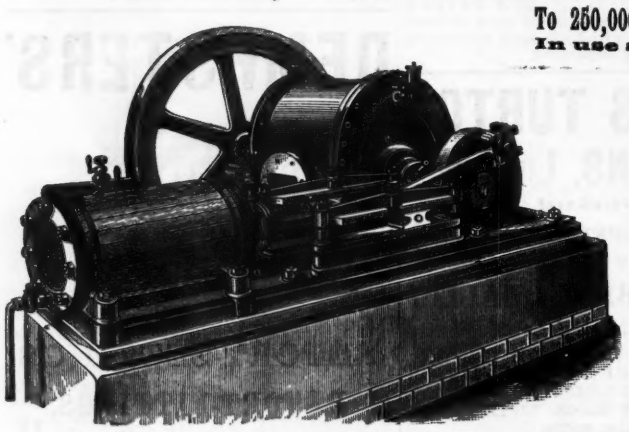

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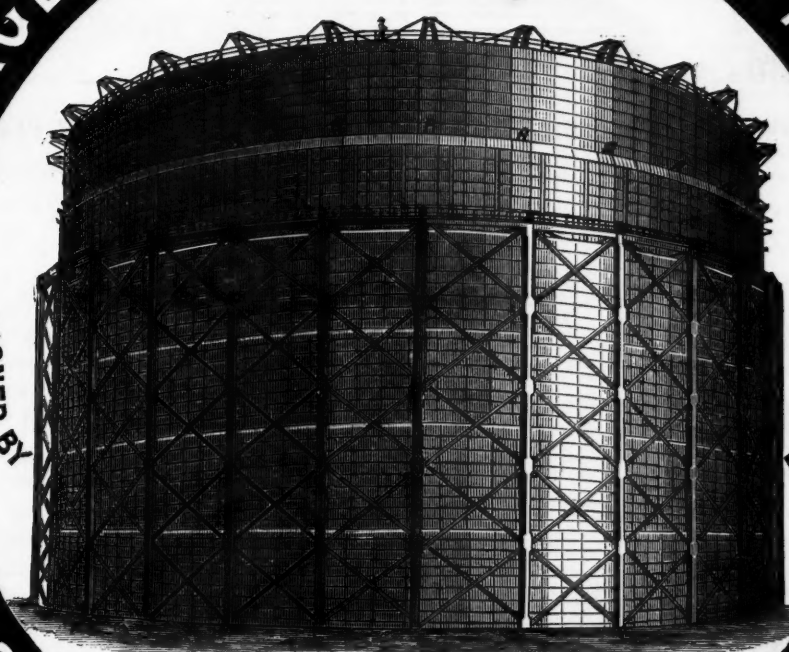

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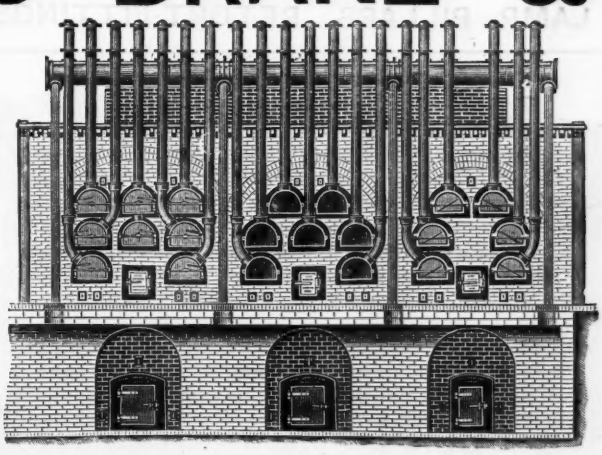

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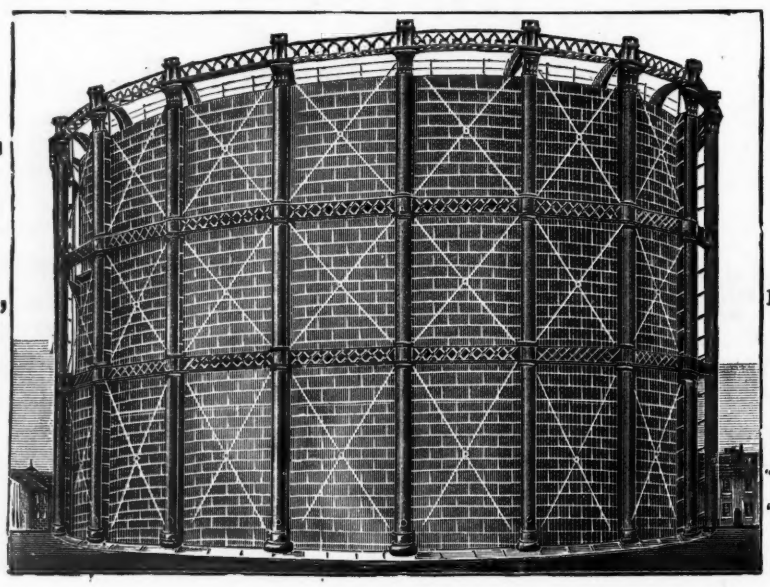

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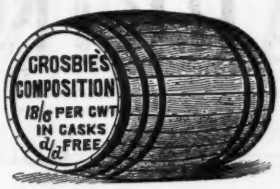

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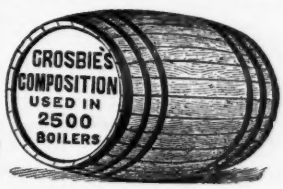

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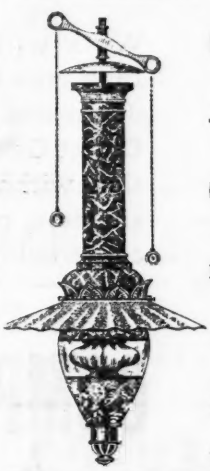

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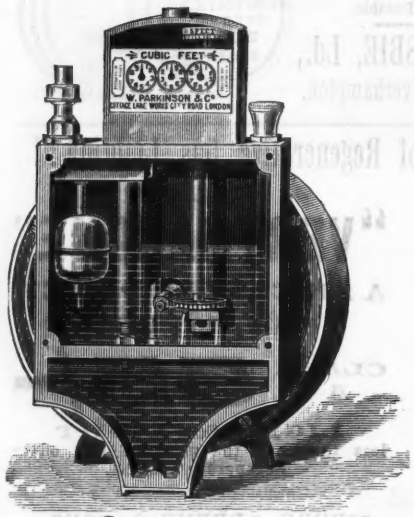
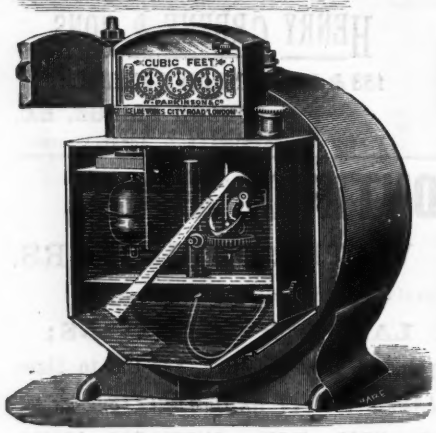


ORDINARY WET METERS

IN CAST-IRON CASES.

Work with very little friction. Will stand very high pressures. Cannot possibly be shut off by sudden increase of pressure, the Float being affected by Outlet Gas only. Allow for loss of water by evaporation without materially affecting the registration or shutting off the gas. Unexcelled for simplicity of construction, excellence of workmanship, or accuracy in registration.



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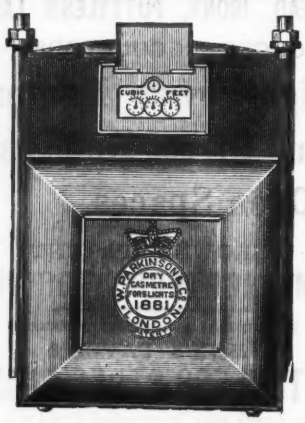
The Slow-Spoon Compensator has been in extensive use for many years; it maintains an unvarying water-line without appreciable friction, and provides a large reserve of water. The Float arrangement allows sudden or excessive pressure on the Inlet without affecting the working of the Meter or extinguishing the Lights.



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These Meters are unsurpassed for accuracy of registration. The cases are made of the best Charcoal Tin Plates; and each part of the Meter is stamped by special Machinery to ensure uniformity and exactness in construction. The Diaphragms are all of the best Persian Sheep Skins, carefully selected and the brasswork and smaller fittings are of superior workmanship.

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[See also Advt., p. 48.

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